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R. H. The Prince of the Netherlands

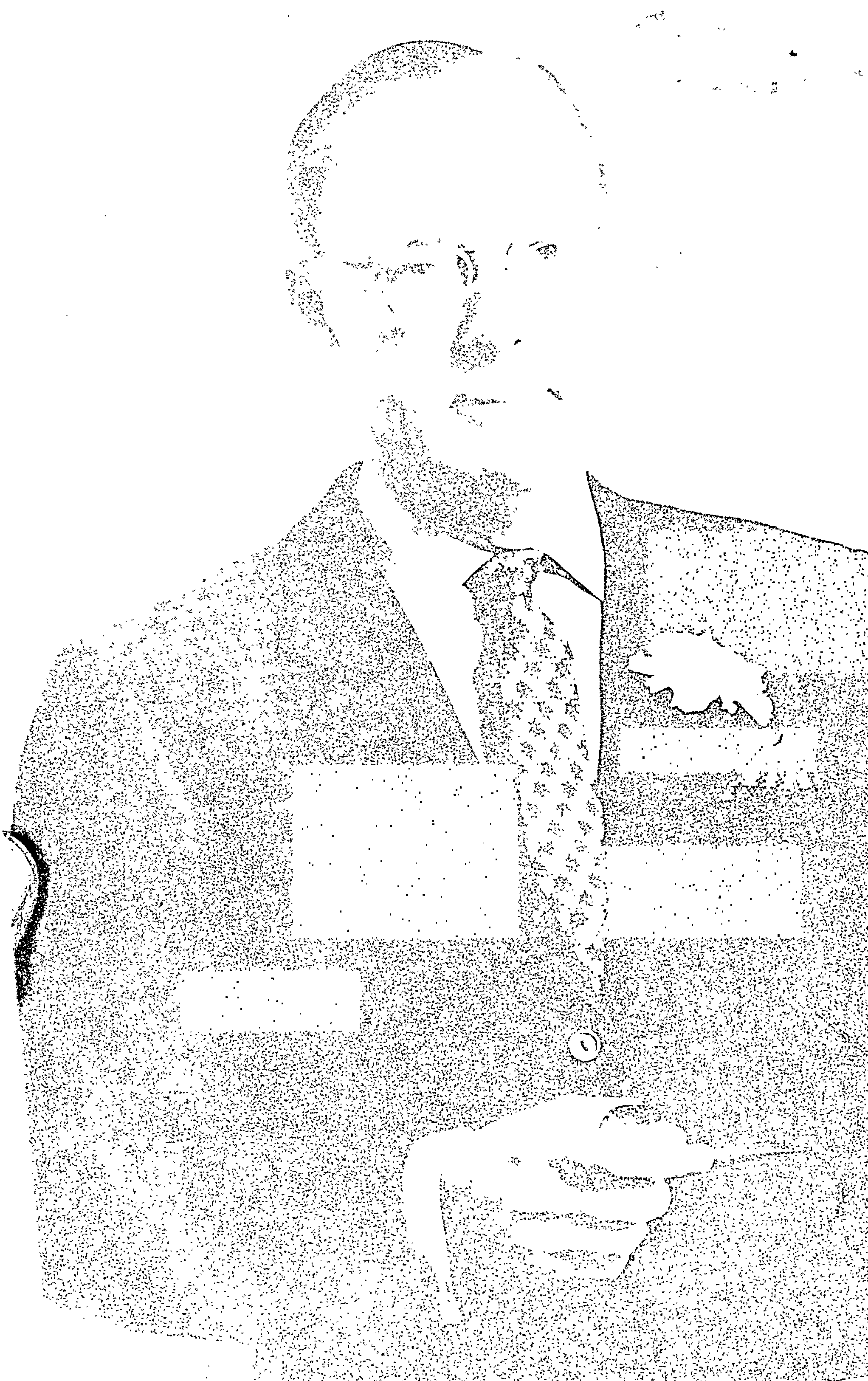


proceedings of the third international congress of medical librarianship
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edited by

Ellison Davis and W. D. Sweeney

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excerpta medica 1970 amsterdam

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The Netherlands Union of Librarians
The Excerpta Medica Foundation, Amsterdam

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The Committee further wishes to thank the Royal Netherlands Government and the Rt. Hon. The Lord Mayor and Aldermen of the City of Amsterdam, who were joint hosts at the Reception given for delegates during the Congress.

1 planning and administration

2 classification and cataloging

3 information storage and retrieval

4 bibliography

1 planning and administration

2 classification and cataloging

3 information storage and retrieval

4 bibliography

5 education and manpower

6 national and regional systems: developed countries

7 national and regional systems: developing countries

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opening address by the patron of the congress h.r.h. the prince of the netherlands

Mr. President, Your Excellency, Ladies and Gentlemen:

It was with great pleasure that I was able to accept your invitation, Mr. President, to open the Third International Congress of Medical Librarianship. This pleasure stems not only from the fact that, after London and Washington, you have chosen Amsterdam as the meeting place for your Congress, but also from the fact that the actual organizing of another international congress, in which so many countries are represented here this morning, indicates the great importance, particularly at this time, of medical librarianship.

This is, I think, fairly easy to understand. The last few years have witnessed rapid technical developments in your speciality. Tempting as it would be to elaborate on this point, I shall leave that to those of your distinguished colleagues who will be addressing you this week.

I should, however, like to say a few words about the changes in your profession which arise as a result of these technical developments.

Until not so long ago, a librarian was a man who occupied himself with the administration of collections of books and journals. There are any number of jokes about librarians, and all of them have one thing in common: the librarian is seen as an elderly man or woman, sitting in some dusty corner, spending most of his time reading his books and being thoroughly irritated when asked for assistance by a library user.

Whatever one may feel about this kind of joke, it is clear that it is something of the past. Today's librarian is not just someone looking after a collection of books, but someone who is handling knowledge and information. Your task has become such a specialized one that even the most critical layman cannot any longer deny that you must be able to speak, on a basis of equality, with specialists in other fields, in your case with members of the medical profession, about the information in your keeping.

The librarian is also expected to offer this information to the user on his own initiative. In short, he is not simply a librarian, but he is also an information officer.

I know that this new development makes many demands on you: you have to be constantly open to the employment of new techniques, you have continuously to discard old concepts — in many instances concepts and practices which were sacrosanct — and you have to pursue your new task as librarian/information officer in the face of resistance from your surroundings.

But I believe that you, as medical librarians especially, *must* meet these demands. Not only because of the actual position of the librarian, but, in particular, because the developments in medical science today are so rapid that the resulting flood of literature is likely to bring the whole business to a grinding halt unless there is a concomitant system of efficient and effective data assimilation and processing. You are the linchpin of this process and it is for you to keep it going.

I am convinced that this Congress, with its lectures and discussions and with the opportunities for personal contact which it provides, will enable you to meet these exacting requirements all that more easily and smoothly.

A few moments ago, I said how pleased I am that, after the United Kingdom in 1953 and the United States in 1963, you have chosen to meet in the Netherlands in 1969.

In certain areas our application of advanced library techniques in the Netherlands is not quite as developed as, for example, in the U.S.A. I do nevertheless feel that your choice of Amsterdam was a good one. The Netherlands have at their disposal a comprehensive library network, in which libraries co-operate closely with each other. Some of these libraries, particularly those attached to universities, have been in existence for centuries and possess collections of much historical interest. Moreover, Amsterdam is the headquarters of the Excerpta Medica Foundation. As you know, and as you will be hearing more of on Wednesday, this Foundation has recently embarked upon a far-reaching development in the automation of medical information.

I would be doing our capital a great injustice, however, if I did not at this point also say that Amsterdam is one of the most beautiful cities in the Netherlands. I have even heard it said that it is one of the most beautiful in Europe. All the more reason, therefore, for your having decided to foregather here this week. I do hope that in the course of your stay here you will have the opportunity to enjoy some of this city's attractions.

With the wish that this Congress will provide for a useful exchange of views, and contribute, above all, to a further expansion in international co-operation amongst medical librarians, it is both an honour and a pleasure to declare open the Third International Congress of Medical Librarianship.

opening address by the president of the congress

Dr. P. J. Gaillard

Your Royal Highness, Your Excellency, Mr. Queen's Commissioner, My Lord Mayor, Distinguished Guests, Ladies and Gentlemen:

I count it both an honour and, at the same time, a great satisfaction to be able to welcome all of you here on the occasion of the official opening of the Third International Congress of Medical Librarianship, which is especially devoted to the theme 'World Progress in Medical Librarianship'.

Your Royal Highness, we are particularly honoured that you have been willing to act as Patron of our Congress and that you have found the time to be with us this morning to officially open the Congress. May I be allowed to say how much we appreciate your interest in our enterprise and how much everybody will be stimulated by your participation. Thank you once again.

That Your Excellency has been willing to accept our invitation is very highly appreciated. You know that the organizers of the Congress owe you many thanks. Without the technical and financial assistance of the Ministry of Education and Science, the Congress could not have taken place in the Netherlands. Also, I would like you to convey our sincere gratitude to the Government for their generosity in giving the reception which is to be held in our beautiful Rijksmuseum on Tuesday evening.

I also want to extend a special word of welcome to the Queen's Commissioner for the Province of North Holland and the Lord Mayor of the City of Amsterdam.

My Lord Mayor, the organizers of the Congress are very happy that you are to act as co-host with the Ministry of Education and Science for the reception at the Rijksmuseum. We know that both you and Her Majesty's Commissioner are greatly interested in scientific and cultural events that take place within your territory, a territory that combines natural beauty with long and great traditions in the arts, trade, education, and the sciences.

As in many other disciplines, there is indeed an immense increase of medical literature appearing year after year, month after month, and even day after day. In all fields this may cause great difficulties, but in the medical fields especially it can occasionally be disastrous to be uninformed about recent progress. In fact, no medical doctor, whether a general practitioner or a superspecialist, can adequately treat his patients without being informed of new views, new explanations, new treatments, new theories or new approaches in biophysics, biochemistry, enzymology, etc.

At the same time, however, we know that it is factually impossible for a doctor to collect the necessary information and read it adequately in the few spare minutes available to him.

As a consequence, medical librarians have a very heavy responsibility indeed. They must find the ways and means to acquire the essential information, to organize and store it in such a way that it is easily retrievable, and even to actively promote its

dissemination to those who may need it. As far as I am concerned, being a doctor and not a librarian, I can only say that I have profited immensely on the many occasions that books, monographs, reviews, and journals were simply put on my desk by someone who thought that they contained essential information which I would never have found by myself, because I would not have known that this type of information even existed.

Therefore, librarians, editors, and doctors need to co-operate during the whole process, from the transcription of scientific information, through publication, dissemination, and storage, to the retrieval at the appropriate time.

Technical facilities and know-how have developed in recent years in such a way that it is a challenge for every good medical librarian to play his part in this worldwide co-operative endeavour so vital to the happy future of mankind.

opening address by h.e. the minister of education and sciences

*Dr. G. H. Veringa**

Your Royal Highness, Mr President, Ladies and Gentlemen:

His Royal Highness Prince Bernhard has just told you how delighted he is that, after having met in the United Kingdom and the United States, you have thought fit to convene this important Congress in the Netherlands. One of the reasons why we share his delight is that preparations are being made in this country to set up a high-level centre for the national co-ordination and promotion of the dissemination of scientific and technical information and for the establishment of the required international contacts and co-operation. The rapid propagation of the pursuit of science and the constant appearance of new specialisms in science have resulted in a tremendous increase in the volume of scientific and technical information. Consequently, every country should adopt an appropriate national information policy correlated to its scientific policy, which is to ensure that the greatest possible benefit is derived from the huge sums spent on the pursuit of knowledge, and every country should possess a central organization to enable it to achieve that end.

Just as the transfer of information is inseparably linked with every form of scientific research — the Science Advisory Committee, set up by the President of the United States of America, rightly pointed this out in the report on 'Science, Government and Information' published when Professor Alvin M. Weinberg was Chairman — so should our policies in respect of the dissemination of scientific and technical information be an integral part of our policies in respect of the pursuit of knowledge.

Last year, a Working Group under the chairmanship of the President of the Netherlands Advisory Council for Science Policy published recommendations stressing the need to set up a high-level centre and giving tentative terms of reference. The Working Group also points out in its recommendations the desirability of placing the national policy on such a broad base that it would embrace the entire cycle of the transmission of scientific and technical information, a process which consists in presenting new knowledge in such a manner that others can use it with the least possible delay and trouble and in such a form that computers can read the information, a process which consists in collecting, organizing, retrieving and making the knowledge stored available, and lastly, a process which consists in encouraging people to put the knowledge stored to practical use and take it as their point of departure for fresh research. I need hardly emphasize that scientific libraries constitute a vital link in the cycle I have just described.

Your Congress is devoted to various problems and aspects of medical librarianship and to the part medical libraries play in the process of transmitting biomedical knowledge. Although you will only be touching upon one aspect of the link concerned

* Due to circumstances beyond his control, Dr. Veringa was prevented from attending the Opening Ceremony. His speech was read on his behalf by Mr. J. H. Grosheide, State Secretary, Ministry of Education and Sciences.

in the chain, I believe your discussions will not only be of great value to all professional men but will also provide information that will help the Netherlands in no small measure to determine her national policy with regard to the dissemination of scientific and technical knowledge.

As I went through your splendidly prepared programme, I noticed that several of the lectures will be dealing with subjects that the Working Group I spoke about a moment ago has included in the tentative terms of reference it has drawn up for a high-level centre. To mention only a few — there is the development of networks, the analysis of information requirements, the manner in which information should be presented, the co-ordination of acquisition, standardization and, last but not least, training. As to the development of networks, I should like to tell you briefly what is being done in the Netherlands in anticipation of the setting up of a high-level centre — we have already started work on an automated medical information network.

A separate working group has been set up to deal with medical information; it has worked out a plan for an experimental project on the lines of the Excerpta Medica information system. The plan provides for the establishment of a computer network with on-line communications linking the editorial office of the Excerpta Medica Foundation in Amsterdam with its computer centre, with Leyden University computer centre and with Leyden University Hospital. This will give the organizers an opportunity to gain experience and prepare differentiated studies of the individual user's requirements and of the use he makes of the services offered to him. The project will also provide a valuable source of information that can be used for the development of software with which to connect computers of different makes; software with which to simultaneously update 'files' stored in a number of memories in different computer systems; software that can be used for the conversational use of terminals. If the experiment is a success, it will be the first step towards the creation of a national network of computers and telestations linked for the dissemination of medical knowledge.

Excerpta Medica in Amsterdam is to play a major part in this project, therefore I agree with His Royal Highness when he says that you chose the right place when you decided this time to convene your Congress at Amsterdam; I hope it will be a great success.

closing address by the president of the congress

Dr. P. J. Gaillard

Ladies and Gentlemen:

We have now come to the final point of our agenda, the closing ceremony. I trust that you will agree that it is not my task to express your views about the value and the quality of the presentations. I could not possibly do so. I may be allowed, however, to say that you all have been charming and wonderful guests. Before this Congress I did not know many medical librarians, but I assure you that the confrontation has been a real pleasure and a great experience for me. Your knowledge and enthusiasm are a guarantee towards the future development of medical librarianship and especially to the further improvement of a world-wide co-operation and co-ordination. We hope that this Congress has met your expectations and, if so, the organizers will have every reason to be satisfied. With the questionnaire which has been distributed, we have tried to become informed about your views. The study of the answers is meant to serve the future organizers of international congresses in your field.

You will understand that I am glad to use this opportunity also to say a few words of appreciation to the many people who have contributed to the success of the Congress. I trust that I may do so on behalf of you all.

So, first of all, I want to thank all speakers, chairmen, and discussants. Without their great effort and their co-operation there would not have been a Congress at all.

Secondly, may I once again express our gratitude to His Royal Highness the Prince of the Netherlands for having agreed to be our Patron and for his having officially opened the Congress.

Thirdly, I would like to thank the sponsors of the Congress, namely, the Royal Netherlands Academy of Sciences, the Netherlands Union of Librarians, and the Excerpta Medica Foundation, who took on the organizing of the Congress nearly two years ago.

Fourthly, I want to express our feelings towards the generous financial and professional assistance that has been given by the Dutch Government.

Fifthly, we owe very much to the Scientific Committee. This Committee has been occupied with the scientific part of the Congress for over one and a half years. The members have given freely and fully of their time in attending meetings to deliberate on the programme of invited lecturers and free communications. Much of the success of the Congress is due to the members of this Committee: Madame Madeleine Wolff-Terroine, Mr. Harold Izant, Dr. Richard Polacsek, Dr. Frank B. Rogers, and Mr. Philip Wade. They all deserve our sincere thanks.

I also want to say how much I appreciated the activities of the members of the Organizing Committee. It was a great pleasure to work with them.

Then, there is a special group: the International Liaison Committee. We are grateful to all 36 members of this group for their efforts in giving publicity to the Congress in their respective countries and for all they have done to get their colleagues to attend here this week. It would be improper to single out any particular [illegible],

because they have all done so much, but I feel it is only right to mention the activities of Mrs. Jacqueline Felter, representative for the United States of America, and to say how much we appreciated her enthusiastic support.

A word of thanks also to the secretaries, Mr. Chorus, who was concerned with the organizing aspects of the Congress, and Mr. Ellison Davis for his work as secretary of the scientific programme.

I would also like to thank the very many people whom it is impossible to mention but who have worked so hard behind the scenes to make this Congress a success. In this respect I want to extend a special word of appreciation to the group of excellent people who took care of the simultaneous translations. They certainly had a busy, tiring, and difficult job. Thank you all very much.

Last but not least, I want to thank our Honorary Presidents, Mr. Scott Adams and Dr. Folke Ström.

It is my personal opinion that medical librarians have indeed a very great responsibility not only for the proper dissemination of important information but indirectly for the future development of optimal medical care as well as for the adequate training of undergraduate and graduate medical students.

I have still one final point to make being your host.

I have observed that although many participants have stayed practically all the time in this congress building others have managed to combine science with pleasure by flying out to museums, to see the developing spring and to visit the bulb fields and the flower exhibition, but nobody will have managed to visit all the interesting and beautiful spots in the Netherlands, nor will they have become acquainted with the people's attitudes and characteristics.

We have tried to find a simple, quick, and artistic way to let you see Holland in twenty minutes by showing you a brand new film entitled 'Sky over Holland'.

This is meant as a farewell, as a wish for a safe journey home and as a plea to come and see us again. So, then, good-bye, tot spoedig ziens, au revoir, auf Wiedersehen, adios.

1

planning and administration

the medical library and the information needs of the medical community

S. Bergström

The program of this International Congress clearly proves the rapid increase in both the volume and the level of sophistication of the scientific efforts in the field of medical information transfer and library science. The excellent scientific program of the coming week is offering you reports by librarians and other experts from all fields involved.

My own very personal remarks, however, are only those of one of your grateful customers, who has grown progressively more frustrated by the lack of resources placed at your disposal to meet the rapidly increasing needs of the medical libraries. I cannot add to your expert knowledge and I will therefore confine my remarks mainly to general problems of the user of medical information.

By training, I am an M.D. who has specialized in biochemistry. During the first two decades of my scientific career it was no great problem to keep abreast of the development in the narrow fields of my own biochemical research. It could be done relatively easily by leafing through *Chemical Abstracts*, by browsing through half a dozen of the leading primary journals, and by keeping personal contacts with the few groups in the world that were active in the same narrow fields of research.

However, by the 1950s, the sheer volume of the information was beginning to be difficult to handle. When the compounds that I had been concerned with from a chemical and biochemical point of view became of increasing interest from a physiological and clinical point of view, it became quite obvious that it was impossible to keep track of the work in these fields without better tools and resources to access the pertinent literature, unless an excessive amount of time was used.

In retrospect, this personal experience was a very important factor in stimulating my active interest in the field of automated information retrieval. Another decisive factor was the experience as Dean of the Medical Faculty of the Karolinska Institute in Stockholm during the early 1960s, when the planning of a large new teaching hospital was begun and the need for an integrated medical information system became obvious — a system that includes not only the usual hospital information but also should give the clinicians and research workers rapid access to the medical data of the literature, a system that we plan to have fully operative when the hospital opens.

Certainly the technical capability is already present — from communication satellites with world-wide TV and radio coverage to computer-operated information systems with thousands of terminals where the desired information can be produced in seconds on a local TV screen or printed out as hard copy. I am not going to discuss the almost unlimited technical possibilities that already are available, as Dr. Dimond will deal with some of these questions.

Here, as in other fields, the technical resources made available depend on local and international political priorities and agreements, problems that largely fall outside the scope of this Congress. However, the main driving force of development

is dependent upon your more or less concerted efforts in research and teaching.

In my view, the computer specialists or the communication experts no longer constitute the sector limiting the rate of progress. The main rate-limiting factors are present inside the medical field, and progress is largely dependent on the joint efforts of various groups of medical personnel in co-operation with medical librarians and medical information specialists.

First of all, the information process in the medical field has to cover the widest possible spectrum of needs. The users range from medical scientists working in any of the basic biomedical sciences, including biostatistics, biophysics, biochemistry and chemistry, microbiology, genetics, etc., to the clinician interested in the side effects of a specific drug in a specific age group or the health worker making world-wide epidemiological studies, etc. All these groups have widely different information needs both as to type of information, and speed and methods of dissemination.

We must also answer such questions as how the needs for continuing education of the general practitioner in different countries can best be met, how we can help him to get rapid access to the earlier medical history of a patient whom he sees for the first time, and what can be done to speed up the flow of medical information inside the hospitals to increase their efficiency.

In the future it will not be possible to separate the doctor's problem of how to get access to local medical information related to his patients from his need for continuous evaluation of these data against the information of the current literature as to a specific disease or the latest facts about a new drug.

When it comes to side effects of drugs, it might be of paramount importance to pick up the first report of a serious side effect: a 80-90% information recall can, in this field, be quite unacceptable. The methods and costs must therefore be differently evaluated than in other fields.

A clear-cut example of this need for co-ordination of data from the literature with those of the medical records is found in the poison information centers that have been organized in many countries. These centers carry some sort of file of the most common commercial products that cause poisoning in the area. As the majority of the cases involve children, they are often associated with pediatric clinics, in other cases with intensive care units, but in most instances they only give out information by telephone.

The largest, somewhat loosely co-ordinated group is that of the 550 poison control centers in the U.S.A. The federal government is supporting a National Clearing House that keeps a central card file on potentially poisonous products on the American market. These cards contain information on the composition, concentration, and lethal dose of the ingredients, as well as on symptoms and treatment. The cards are distributed to all the American poison control centers as well as to many foreign centers. The Clearing House makes great efforts to obtain detailed reports of all cases observed at the centers, an apparently difficult but important task, as most of the common cases of poisoning are not reported in the literature, where mainly unusual and dramatic cases are reported.

In Sweden, the government has arranged one central poison information center, where a full-time medical staff is employed that continuously evaluates not only the

data of the products marketed in Sweden out of the literature, with the aid of MEDLARS, CAS and *BA*, and material from the Pesticide Information Center and the cards from the National Clearing House, but also requests the medical records of all hospital cases treated for poisoning. Before long we hope to have this operation fully automated and the basic information available by direct computer access from any hospital or doctor that has access to telex or other terminal equipment. The medical staff should then be able to divert more efforts to difficult cases and to the continuous evaluation of data and upkeep of the file. This is thus a clear-cut case where everybody agrees that there is need for great speed and efficiency, but where also the need for continuous critical evaluation of data both from the literature and from the medical records is obvious.

Actually, the needs are the same in most fields of biomedical information, and it is only to be hoped that the experience gained in the poison control field will speed up progress in other areas.

The need for critical evaluation of literature data has also been acutely felt in other fields, and has resulted in the CODATA project of ICSU for expert evaluation of the reliability of measurements in physics and chemistry.

Work of this type is naturally much more difficult when it comes to evaluating such things as the effects and side effects of drugs. A central role is now being played by WHO in initiating and co-ordinating work of this type. Whatever the final biomedical information system is going to be, it is evident that WHO has to play a great role in it.

The academic libraries have been pioneering national and international co-operation; the future of biomedical documentation and information will depend on an extension of this international co-operation.

As an interesting illustration that might be of value in other areas, let me tell you briefly what happened in OECD after the offer was made by the U S. government to place MEDLARS at the disposal of the European member states on a co-operative basis. As you know, MEDLARS, the data automated version of *Index Medicus*, has been produced by the National Library of Medicine since the beginning of 1964 and used primarily for the automated printing of *Index Medicus*. The magnetic tapes, which contain a much deeper indexing of the articles than the printed copy, have also been used extensively for retrospective searching of the literature. This was first started at NLM and subsequently at a number of MEDLARS centers.

In order to make full use of the capabilities of MEDLARS, the customer needs the help of a well-trained search formulator who also keeps track of the annual improvements that are introduced in the thesaurus, etc.

In 1965 NLM generously agreed to supply the MEDLARS tapes not only to a number of new centers in the U.S.A. but also to the United Kingdom and Sweden for experimental purposes. During 1966 completely new computer programs were produced in both the U.K. and Sweden for the different computers available at these two centers — a fairly large and complex undertaking. At these two European centers, retrospective searches were then offered as a free service and all costs involved were carried by OSTI and by the Swedish Medical Research Council, respectively.

In December 1966 the U.S. government made a proposal to the OECD member

countries of the following content: NLM would place the MEDLARS tapes at the disposal of the European member countries on a permanent basis, provided that they in turn jointly agreed to supply the indexing of 50,000 articles per year of the European biomedical literature. The cost of indexing 50,000 articles was estimated to be about $100,000. NLM was prepared to give free training for periods of 6 months for search formulators and indexers from these countries. However, there was one restriction: NLM was not prepared to support more than one additional MEDLARS data processing center in Europe in addition to the British and Swedish centers, *i.e.*, as in the U.S.A., NLM visualized many trained search formulators strategically located in biomedical libraries of the different countries, who would get their searches processed at one of a few centers.

In order to spread the knowledge of what MEDLARS might offer, the United Kingdom and Sweden offered to process 20 free searches to each country. The cost of further searches was agreed to be $10 per year searched.

OECD promptly sent out invitations to all its member countries. Delegates from about a dozen countries attended a series of 6 two-day meetings during 1967-68 to discuss this proposal.

These drawn-out negotiations have really shown some of the difficulties of reaching international agreements when some member countries do not have a responsible group that can make a rapid decision or raise even very modest sums of money for some preliminary work in the country. When, furthermore, the prospective customer groups in some countries are not properly informed by the delegations at the meetings, it should not be surprising that difficulties arise in reaching an agreement.

By the end of 1968, by far the largest number of searches had been requested and processed for France at the British center and for Finland at the Swedish center. From some countries many times larger than Finland no requests had been received even for the free searches, in spite of the very active participation of their delegates in the negotiations in the OECD group. It was then fairly obvious that further negotiations for a multilateral agreement comprising all the member countries at this point were fruitless and would only delay progress.

The offer from NLM was then modified in such a manner that the multilateral agreement was dropped. NLM has instead concluded bilateral agreements with the United Kingdom and Sweden in which these countries agree to supply a certain indexing support or other developmental efforts. NLM is still offering free training and has declared its readiness to conclude further bilateral agreements with countries that have trained the necessary manpower and developed the other technical facilities necessary to run a MEDLARS computer center. An agreement with France has since been concluded.

Without discussing the pros and cons of MEDLARS in relation to other services now being offered that you will hear detailed reports about during the Congress, and in spite of the failure of the multilateral approach, the MEDLARS offer has been of decisive importance for the development of biomedical information services in Europe. Through these negotiations, it has become clear to member countries that it is necessary to have a national body responsible for the field of documentation and

information, and during this period such groups have been formed or are in the process of being formed in most member countries.

There is also need for economic resources but, above all, for dedicated people who have the interest and capabilities to start experimenting, informing and teaching the prospective users.

One experience undoubtedly gained is that an extensive marketing effort is necessary to make the scientists and doctors accept these new services, services that they usually cannot be without once they have used them.

In order to do this marketing one has to know the needs of the customer and have his confidence — and who would be better suited for this job than the properly trained medical librarian? It is under the able and energetic leadership of the medical librarian in Helsinki that Finland has the highest utilization of MEDLARS in relation to its population in the world.

It is therefore my experience that it is, in general, not the computer specialist who should have the main responsibility to develop and negotiate documentation services, but, rather, librarian information specialists who are more interested and knowledgeable in the needs of their customers than in building up their own computer centers.

In this connection it might be of interest to mention the offer of Chemical Abstracts Service to the OECD member countries in December 1967, one year after the MEDLARS offer. Chemical data will play an increasing role in the biomedical field in relation to the increasing knowledge of the complex chemical functioning of living organisms. The tapes of *Chemical Titles* and of *Chemical Biological Activities* had been available commercially for some years, but only a few subscriptions had been placed in Europe. CAS then made the offer to supply all their tape services free to a nationally responsible body in each member country for a period of one year after the operation was running. The price after this period would be negotiated at a later date.

In spite of the — relative to MEDLARS — very simple computer operation of the programs supplied by CAS for current awareness service, a regular service operation is only running in Denmark, the United Kingdom, and Sweden, countries that already subscribed to *CT* before the offer. Two to three more countries will be operational very soon and several countries have expressed interest, but together they will constitute only a minority of the OECD member countries. This again proves that it is too early for a multilateral approach. CAS will also negotiate a series of bilateral agreements as NLM does.

Again in our experience with CAS in Sweden, an intensive campaign with lectures and seminars is necessary and it is of great importance to have well-informed librarians locally to inform and assist the customers, even when it is a free service.

However, no evaluation study is more crucial than that of starting charging after a free service. We have now passed that hurdle as far as MEDLARS monthly service is concerned and have a steadily growing group of subscribers who pay a subscription that covers the cost involved. We believe that a period of free use should precede the regular subscription in order to reach an economically acceptable size of the operation rapidly.

Our American friends obviously overestimated the [illegible] for

reaching multilateral agreements in Europe. However, given a little more time, I have no doubt that we will get an intense regional collaboration. But we certainly have to remember that a truly world-wide international collaboration is necessary if we are to reach our ultimate goals.

Let me add a few words about competition. Politicians and professional organizers have a tendency to see unnecessary duplication in much scientific work and are often overzealous in recommending centralization. This might be all right when it is a matter of stabilized services and functions. However, in the field of biomedical documentation, we are in the very beginning of a period of intense experimentation, as we know very little about the information needs of the different groups of the medical community.

As in other research areas, an individualistic and aggressive research approach during this period will certainly yield results quicker and, in the long run, more economically than when large efforts are spent on a too centralized and cumbersome approach. In a relatively short time the economic realities will make co-ordination a necessity anyway.

Many challenging ideas and projects involving millions of dollars will be discussed during the coming days. I grant you that this can seem farfetched when you daily might be confronted with difficult practical problems of how to keep your own library operation going, when the lack of a few hundred dollars can appear to be an insurmountable difficulty. The spending of millions on experimenting with information systems that give you an access to a literature database in seconds might appear interesting but somewhat outlandish, when the closure of the Suez Canal means that the primary journals arrive by surface mail at your medical library in central Africa up to six months after publication and you lack the money for getting them there by air mail.

However, let us first of all remember that the medical care sector is progressively becoming more critical in all types of countries, not only in the underdeveloped countries but also, for example, in the Netherlands, Sweden, and the U.S.A. As the rapidly increasing population gets more education and learns about the progress of medicine, there will be an increasing and politically irresistable pressure for more and better medical care, which means an ever increasing need for training more doctors, dentists, nurses, etc.

Let us consider some oversimplified statistics: The total world population might now be about 3,400,000,000 and will probably reach 4,000,000,000 around the end of the 1970s. The number of medical schools is now about 800, *i.e.*, one school for about 4,000,000 population. In the developed countries, it is less than 2,000,000 per school. There will thus be a need for two to three times as many schools as now, *i.e.*, 800-1,600 new schools, an obvious impossibility to accomplish rapidly. Let us assume that 400 new schools are established in the next 10 years: together with the thousands of new hospitals that certainly will be established, the need for new libraries and medical information facilities will far exceed anything experienced before.

Furthermore, the rapidly increasing medical news coverage to the public in TV, radio, and the press will put the upwards of 2,000,000 doctors in all corners of the world under increasing pressure to keep up with the accelerating medical progress.

The need for continuing education, more fully discussed by Dr. Dimond, will rapidly increase. Whatever happens, there will certainly be an increasingly serious shortage of doctors. Therefore, any improvement of their efficiency, by speeding up information about medical progress or about the patients they are attending, will be of importance.

If an improved medical information service increased the efficiency of the doctors of the world by an average of only 5%, the gain would correspond to an addition of 100,000 doctors. Their income alone would require more than $1,000,000,000, let alone the total investment necessary to train this number of new doctors.

Seen against this economic background it is not unrealistic to discuss the organization of a world-wide satellite system for medical information, but certainly much less spectacular means can effect vast improvements in present conditions. The invitations from our American friends to participate in these challenging technological endeavors should be gratefully accepted. However, there is no need to feel bashful about what is being accomplished in research and development in the biomedical library and information field in other countries, an outstanding example being the work at the Excerpta Medica Foundation here in Amsterdam.

I am sure that, before long, most medical libraries will have been transformed into biomedical information centers that pursue an active policy of information dissemination and teaching with a staff which has been complemented by experts from various biomedical sciences, and in this way take a more active part in the progress of medicine.

II

the functions of medical libraries in the transmission of medical knowledge*

E. Grey Dimond

To introduce my remarks, I would like to describe a recent experience of mine. I have been in Washington, D.C., on temporary 'leave of absence' and consequently have been away from my own library and away from the librarian amenities which come with a practice in a medical institution. A few weeks ago I needed a copy of Paul Wood's book *The Heart and Circulation*, published in 1956. My need was to document a statement in a manuscript which I was preparing, specifically, that in this particular edition of Wood's book, he had not been aware that there were certain physical changes in the heart beat in angina pectoris.

I therefore telephoned the National Library of Medicine in Bethesda and asked if this particular book was available at the Library. Assured that it was, I drove through 45 minutes of traffic to the Library and went immediately to the index file. There I found the catalog number of Paul Wood's book and presented the card number to the reference desk. The courteous attendant told me the book would be brought from the stacks within a few minutes. At the end of some 30 minutes and after repeated returns to the desk, I learned that the book was indeed correctly cataloged and should be at the Library, but that it was missing and presumed stolen. The librarian was most helpful and volunteered to obtain a loan copy but indicated it would take one or two days and I would need to return.

As is often the case, I had my own time schedule and wanted this reference now and not in two days. I therefore drove to Georgetown University Medical School in Washington, D.C., and went directly to the office of a good friend, an eminent cardiologist. I knew he had a copy of this particular book on his own shelf. I found his office locked and upon inquiry learned that both the doctor and his secretary were ill with Hong Kong flu and that a key to his office was not immediately available.

Next, I went to the Medical School Main Library. There the librarian advised that, as I was unknown to them, I would need some identification. We therefore telephoned a faculty member. He assured the librarian that it was appropriate for me to have access to the Library. Finally, the librarian placed before me a copy of Wood's book, telling me it could not be removed from the Library. I inquired as to the possibility of xeroxing certain pages and learned that this service was not available. I therefore copied in longhand for more than 30 minutes the specific paragraphs and references I needed.

A total of some four hours had now passed since I set out to get my references, and my enthusiasm received its final blow when I returned to my automobile and found a parking ticket on the windshield.

Therefore, the human variables of traffic, book theft, no universal identification, Hong Kong flu, longhand copying, and a parking ticket were hardly evidence that the

* Parts of this paper were published in the *American Journal of Cardiology*. The author is pleased to acknowledge the permission of that journal to use the same paragraphs again.

electronic era had influenced the ordinary physician and his relationship to a medical library.

By contrast, I would like to review the life of many of us in this room and recent experiences we all accept as normal events in a busy 1969 life. There would be variations, but for most of us the following experiences in modern travel and communication would be the calm, accepted pattern of a normal week.

1. Your work required your presence, the next morning, in a city 3,000 miles away. Twelve hours prior to the meeting, you left your home and upon presenting yourself at the check-in counter of the airline, the attendant glanced at your ticket, tapped the keyboard to a computer and in perhaps 15 seconds identified you, your class of travel, your location, your connecting planes, your destination. Remember how the librarian required 30 minutes to find that a single book was missing from an adjacent floor.

2. Stepping out into the corridor you glanced up at the television screen which kept a constant record of each plane's coming and going, date and time. Remember how my repeated trips back to the librarian interrupted his work and consumed the time and energy of both of us.

3. With 20 minutes to spend, you stopped at the bar and watched, live, the playing of the international golf tournament originating in St. Andrews, Scotland.

4. Aboard the plane you were able to watch a video film, hear classical or popular music, at your discretion. A printed program told you the sequence of the music and you could switch from channel to channel as you pleased.

5. Upon your arrival you stepped up to a counter and were greeted by a young lady who had never seen you before. You handed her a credit card; she did not glance at it but put it in a small press, moved her hand back and forth, and handed you the keys to a $ 4,000 automobile. Remember how at the medical library I learned that a $15 book I wanted was 'on reserve', and that I could not leave the room with it.

6. At your hotel, you used the same 'magic carpet' credit card and next month statements will come to your office, which literally no one has seen. From signals put in motion by the credit card, the computer will compute the bill, address the envelope, stamp it, and mail it.

7. Just before going to bed, you picked up the hotel telephone, punched a sequence of perhaps eleven numbers, and only moments later, the phone rang in your home and you were able to speak to your wife and children. From the beginning of the dialing until next month when the statement arrives, your conversation involved just you, your family, and a computer.

8. You glanced at your watch, wondered about the correct time, picked up the telephone and a recorded voice told you precisely the local time. My curiosity got the best of me recently and I looked in the telephone book to see what one could learn by quizzing the telephone. I was overwhelmed to learn that in Washington, D.C., you could:

Dial – A – Devotion
Dial – A – Dietician

Dial – A – Movie
Dial – A – Prayer
Dial – A – Saint
Dial – A – Satellite
Dial – A – Sermonette
Dial – – Your Family Bible

You could receive taped information on Alcoholics Anonymous, suicide prevention, poison prevention, and the John Birch Society, likewise by telephone.

9. In addition to all the above things, you probably read at least one newspaper each day, read a current copy of *Time* or *Life*, carried a popular hard cover book in your brief case, thoroughly enjoyed watching a live performance of 'Meet the Press' or a similar dialog on television, and fell asleep after watching a video tape of a good movie.

I could add to this list, but my intent is already clear to you. Specifically, the technology for a biomedical network is all about us and in use. We do not need to labor over its availability. Instead, we labor within our complex profession without the expedition which we consider ordinary in our non-professional lives. Although I began my remarks in the context of a doctor and a book, I want to extend it to the larger content of the entire health field and information transfer.

First: not one thing that I have described was necessary. In 1820 we could equally well have assembled here in Amsterdam. A quilled letter of invitation would have been sent you in 1819 and you would have left your home some weeks ago by horse, carriage, barge and ship, and arrived safely. Good food and amenities have not changed and, even more thought-provoking, the capability of cerebration has not altered in these 149 years. In 1969, as in 1820, the ultimate objective would be a meeting of men and women, an interplay of human brains, all with the same range of intellectual capacity, emotions, insecurities, and ambitions.

You perceive my cumbersome point: all the remarkable devices I have listed are but to *facilitate* us. Our innate abilities have not changed but our capacities for the endeavors which are a human's specialty have been extended: humans think, humans plan, humans create, humans cry, humans anticipate, humans care . . . and in our special field, *humans* prefer *humans* as their ultimate source of medical care. Machines extend the time we have for these human specialties. Electronics and machines do not replace: if we but use them wisely, they free us from the trap of tedium, the prison of repetition.

old and new

Defining the ways we are facilitated is to remind us of the obvious: the new does not necessarily replace the old. Methods will persist or disappear on merit. The jet is here, the sailing ship is gone. Television is here, yet the book, magazine, newspaper, and radio remain.

alone and together

Some of the learning process or communication is best done totally alone, as with a journal or a book; much can be learned 'remotely' by radio or television. Equally, some of the learning process requires a personal tutor; some essential qualities are contributed by the live presence of a vibrant teacher. Further, other elements of learning require a physical movement of people to a common meeting place, as we are gathered here in Amsterdam, and at that common meeting place communication takes place by printed word, by visual image, by formal organized lectures, by informal free, probing conversations, by techniques which have no scientifically proved rationale: coffee breaks, liquor and food, corridor chats. A national or international biomedical communication network would not replace those learning methods already proved. The typewriter replaced the quill because it was an obvious improvement.

regional and national

Still another point needs to be expressed: the gamut of things we need in our biomedical communication will, as in my medical analogy, need both *regional* and *national* contribution. The *local* news by radio, television, and newspaper is essential coverage, yet how impractical it would be for every local or community television, radio station, and newspaper to insist upon providing its own *national* news service. Some things are done better nationally. Some things can be afforded only if costs are shared. Some things done regionally (the St. Andrews golf tournament) need to be shared nationally.

replay and live

Another obvious fact: just as we have noted that there are programs which are best done locally and others which are best done nationally, there are also things which can be well done with *video tape replay* and equally there is a place in medical education for the sense of involvement, the sense of anticipation, the excitement of sharing an unpredictable moment. Specifically, there is a need for *live television.*

content or entertainment

The fact that television makes it possible not only to hear but also to see guides us too often into feeling that the justification for television must be animation, props, motion. We find ourselves excessive in our use of props and animation and forgetful that voices, faces, and content, not vehicles, still are the message. Some of the finest use of television, such as in 'Meet The Press', news presentations, etc., is simple dialog, no props, slides, no personal involvement of the listener; yet, such programs are obvious prime means of communication and education. Today there is no professional means of using this remarkable vehicle of television to facilitate medical knowledge and communication. A physician learns of a national epidemic from the newspaper. His patients learn of aspirin, antacids, and tranquilizers from public

television commercials. Surely, there must be merit in a nationwide television communication network which makes available to the health field this remarkable vehicle, both for professional communication and, separately, for proper health information for the general public.

continuum and culture

Although in medicine we refer to premedical students, medical students, residents, and practicing physicians, in reality we are speaking of a *continuum*. From premedical to medical student, to house staff and to physician, we are speaking of the same human being at different stages of his life. Those techniques of learning with which he becomes comfortable as a premedical student and medical student will stay with him throughout his lifetime. If our capacity for instruction during these formative years is limited to the patterns of the 1930s, how can we expect the mature practicing physician to be comfortable with the potential of his own computer console? The medical school faculty must be prepared to teach him with the media of his culture.

tv and 1969

Today's citizen is conditioned differently. He arrives at college age having already watched 15,000 hours of television. He is also comfortable with computers and programmed learning. The National Commission on the Causes and Prevention of Violence, headed by Dr. Milton Eisenhower, although concerned with different issues, documented certain remarkable characteristics of modern life. By the time a 5-year-old child enters kindergarten, he has spent more time learning about life from the family TV set than the average student in a liberal arts program spends in a classroom in his 4 years of college attendance. The average American between his 2nd and 65th year spends 3,000 entire days (almost 9 years of his life) watching television.

The health field, one of the largest segments of modern society, understaffed, overdemanded, surely needs the fullest aid of this thoroughly accepted communication vehicle. The American public, bombarded by quasi-professional health information from newspapers, magazines, radio, and television remains medically uninformed. Thoroughly prepared, professionally prepared, health information would offer a major means of providing guidance on medical, social, and psychological issues.

open and shared

Medical *care* and medical *education* will increasingly share the students' communication and bring the medical school, community hospitals, and the university campus all in to a common endeavor: a regional responsibility. Communication, compatible records, and dial-access data banks are essential ingredients to an 'open medical school'. An 'open medical school' means total utilization of health facilities and health personnel with medical students ranging wide throughout the region, no longer restricted to the walls of the medical school, no longer removed from the real-life and real-death situations of the community, and, important in the context of this

meeting, no longer physically tied to a central passive depository of books but, instead, actively, electronically, and remotely retrieving from it.

Our potential is limited if we confine ourselves to thinking in terms of books and retrieval of book information; we must also think of universal medical records, universal insurance forms, universal data retrieval.

conclusion

When this has all been accomplished, I will end where I began: a doctor with a question. However, instead of a half a day of a physician's life spent in pursuit of an answer, he will have his answer and still have a half day to invest in the unique human role of physician. All I have described is but to remove 'the trap of tedium, the prison of repetition', and facilitate information transfer.

How can we speak of books and libraries without speaking of their active use? Is this not *information transfer*, is information transfer not *education?* In building an electronic system that makes libraries active, we are at the same time speaking of a system which can only be useful if there is the widest of use, the awareness of economy, the logic of systems analysis: we are speaking of a *communication network*. With the investment in such a system, it is then logical that its use not be restricted to the medical profession and books, but be expanded to live and video-tape TV, to dial-access data banks and films of all varieties, to self-instruction, to self-evaluation, to general public health education, to uniform health records, to uniform insurance forms, to prescription writing, to written (hard) copy accessibility, to consultation, and to diagnosis.

The logic of all this does not originate with me. It is as real as the examples of modern communication with which I opened these remarks. These things are all the real world of this era. The need for a co-ordinated national effort has brought forth the Congressional legislation which has authorized the NLM to form the Lister Hill Biomedical Center and Network.

The entire phrase, Lister Hill National Center for Biomedical Communications, is new to the eye and ear of the profession. In 1947, the profession found the phrase National Institutes of Health equally unfamiliar, and the potential of that changing legislation equally unapparent. Twenty-two years have passed very quickly and the immense, effective influence of the NIH has verified the wisdom of their altered role.

One suggests that again the time is right, the need great, the techniques ready, for this new legislation of August 30, 1968, formally establishing this Biomedical Communication Center as a responsibility of the NLM, and the promise of a benevolent giant in medical education has been launched. Those factors that I have described as missing and needed will be the responsibility of this new Center.

Table I. *Organizational assignment categories.*

	School A Percent of population	*School B* Percent of population
Students		
Medical		
year 1-2	11	10
year 3-4	11	10
Graduate	7	4
Undergraduate (paramedical)	6	6
Subtotal for students	38	30
Residents and interns	—	9
Professional-level staff		
Preclinical disciplines	5	8
Medical specialties	13	15
Surgical specialties	4	5
Voluntary faculty	38	16
Medical specialties	25	8
Surgical specialties	13	7
Paramedical specialties	1	2
Administration	<1	3
Support facilities	1	1
Hospital services	–	12
Subtotal for staff	62	61
Total for all users	100%	100%

large battery of variables, we attempted to determine a smaller set of variables which had a favorable cost-benefit ratio.* The one user characteristic for an academic population with the most favorable cost-benefit ratio is *publication rate*, which we defined as the number of articles or books published by the user in an average year. Also useful was the user's organizational assignment, that is, his formal institutional position. Table I includes our organizational assignment categories and illustrative data for two schools. We included the employees of the medical school and students who should be able to look to the library for meeting their work-related information needs. The third variable with a favorable cost-benefit ratio was the user's work activity, which we determined on the basis of existing information. Table II indicates our major work activity categories with data for two schools. A fourth variable, distance from the medical school library, had a much lower cost-benefit ratio in predicting utilization.

Measures of the utilization of alternative information and document resources in the environment were eliminated from the cost-benefit analysis, because of necessity to go to the user to get the information. However, for planning purposes these variables could be profitably explored by the librarian if he were concerned about the relative use of his facility, *i.e.*, how well it competed with other libraries and sources of materials and information. How well a library competes for a user's business may be a useful measure of its success.

* We defined *cost* as the time required by the library staff to collect and analyze data and *benefit* as the power of a variable to explain variation in utilization.

Table II. *Work activity categories.*

Work Activity	*School A* Percent of population	*School B* Percent of population
Teaching	53	45
Research	59	45
Direct patient care	52	48
Administration	18	9
Formal learning	25	30

discussion

In conjunction with utilization measures, any or all of the characterization procedures mentioned can be applied to advantage by a library's own staff in a self-study designed to serve management purposes, such as development of additional access points or service policy changes according to the characteristics of the user. Some libraries have staff who are qualified to plan and carry out such studies with little or no outside help. Unfortunately, at present relatively few seem to be in this position. Therefore, unless the staff bottleneck can be broken, for example, by changing the perspectives and qualifications of the people trained in library schools, we cannot be optimistic that the full potential of these techniques can be realized within the next few years.

The data also have potential for significant theory-building about the user and his relationships to library and information services. The analyses of the explanatory power of user characteristics in this project have only scratched the surface and disclosed the great complexity of factors governing the potential and actual demands for library and information services. We must begin to think about building quantitative models incorporating data about these variables, models which can be manipulated or simulated, and which can potentially provide insights into what factors do indeed make a difference for relating all potential users to information resources.

reference

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the m.d. and the reference librarian: a breakdown in communications

E. Flores de Hartmann

In medical libraries, the reference librarian is the person who is in direct contact with the readers who frequent it. The readers are, in general, doctors, medical and nursing students, and nurses. Unfortunately, in many cases, the understanding between reference librarian and doctor leaves much to be desired, with the consequent result that the librarian renders either deficient or minimal assistance, and that the doctor is not satisfied with such service.

Addressing the American Library Association and the Canadian Library Association in Montreal in June 1960, Dr. Samuel Rothstein (1961) expounded the idea that reference service, even in American libraries, is relatively new, calling it the new dimension in librarianship, and stressing that, as regards service, librarians *should make an effort to render it unrestrictedly and in the best manner possible.*

In practice, it can be seen that librarians have established a completely open system of co-operation, without any restrictions as regards receiving reference service from another library and also returning it, regardless of whether or not the library is in the same town or in the same region or country. An example of this is the National Library of Medicine of the U.S.A., which provides a free service with minimum restrictions; the library receiving help must pay the postage, but sometimes not even this, as in the case of photocopies. The understanding between the librarians is clear and unobstructed.

This is an achievement which, in Spanish, we would call an 'indoor achievement': it produces results among librarians. The understanding breaks down at a most important point, vital to the library, which is when the reference librarian and the doctor come into contact and cannot establish a good relationship. When such contact has failed, not to say when hostilities have arisen, the *raison d'être* of the library is then reduced to its lowest point: that of storing books. Undoubtedly, there are a great many doctors who ask for and receive excellent service. But those who, on the contrary, have only complaints against the library have created a situation which must be cleared up. Who is the culprit, the doctor or the library? It is necessary to find the cause and produce a swift and effective remedy.

Let us suppose that the relationship between the reference librarian and the medical and nursing students and nurses is following an up and down course, common to all human relationships, but always endeavouring to keep up cordial relations. Now, of the doctors who make use of the library, some are members of the teaching staff of the medical school, or are research professors in it, others may have nothing to do with the school, but all of them come to the library attached to the school, or go to other medical libraries in the town, such as exist in hospitals, medical academies, etc.

The greatest difficulty, referring here to the professors, is that, incredible as it may seem, they do not really understand the functions of the library and the whole extent of the service it can provide (Cheney, 1964).

As concerns the doctors who do not teach, the principal cause inhibiting

relationship with the librarian is that of sending their secretaries to the library to make a bibliography, to examine a document, etc. The librarian tries to help, and the secretary tries to take advantage of this help, but in many cases both efforts fail because either the doctor did not explain himself properly or the secretary did not understand exactly what the doctor wanted. The librarian's enquiries on the subject, when talking it over with the secretary, throw no light on it. As a result, the librarian has to ring up the doctor. I leave it to your imagination to guess what happens when four or five ill-informed secretaries arrive at the library at the same time: the consequent telephone calls, the tracking down of the doctor in question, and his impatience at having to spend more time on a matter which he had considered finished. When secretaries do not ask the librarian for help and fail in their undertaking, the 'bad' state of the library becomes one of the subjects to be dealt with by the committee entrusted with the improvement of the library.

When the messenger sent by the doctor is one of his students, the situation improves; still it is neither bad nor good. In this case, the doctor expects both the student and the librarian to understand what it is he needs. But one can err while being overly zealous, and hence cause delay by providing, in the end, material which is not really going to be of much use. This means that while the student does know the subject of his enquiry well enough to enable the librarian to render him, and consequently the doctor, the best service possible, the student does not, however, always know what limits to keep to.

The situation with the best possibilities is when the doctor comes to the library himself. But then he may refuse to answer any question which may be put to him in connection with the subject; he may react with offended dignity, would rather be a martyr than a confessor, with the ensuing result that any good understanding with the librarian breaks down. If, consequently, the doctor does not find what he is looking for, or if the service is deficient, the library will carry the blame. Allow me to point out here that I do not mean to say that the librarian is always the innocent victim, for there exists what has been called the librarian with the 'investigator façade', capable of making enemies at first sight, and who, by his insistence on knowing the *specific* wants of the reader, hints at one of two things: either the reader must reply satisfactorily to his questions or, if not, the reader must leave at once (Ingelfinger, 1967).

But we must not lose sight of the necessity that the doctor be specific in his requests, for, in order to get a satisfactory reply from an electronic brain or computer, one must indicate clearly what is wanted (Chen and Kingham, 1968). These machines reply to what is said to them, not to what the user is thinking; computers can come up with a substitute if they are asked to and if they are programmed to do so, but unfortunately, they cannot decide what is best for the user in question; neither can they indicate the quality of the information they are going to include in the list they provide (Cranefield, 1967). For the moment, let us remember that, although man is slow and therefore not very satisfactory in exhaustive research work, electronic brains do not yet seem to give the desired result either, or at least Miwa Ohta (1967) indicates this.

To remedy this situation, it is to be hoped that, when certain measures are taken,

the relationship between doctors and librarians will improve. In the first place, the ideal thing would be for the doctor to find the necessary time to go to the librarian personally, or at least to telephone him. This effort on his part would be much appreciated by the librarian, for we all know how busy doctors are, and certainly this action would be responded to with enthusiasm and a real desire to work on the part of the librarian. Since we are talking of an ideal situation, we should remember that the consultant librarian, on his part, should possess as essential qualities, culture, experience, and courtesy (Perales Ojeda, 1956), and, if I may dare to say so, humility (Gordillo, 1957), that is, the knowledge of his true worth and his limitations.

This brings us to an unpleasant aspect of the situation: when the doctor fails to recognize the librarian as a professional, and treats him as an inferior. In such a case, the degree of condescension with which such a doctor speaks to the librarian may be unbelievable, and the perseverance with which the latter strives to maintain a cordial relationship in spite of it, astonishing. Although there are librarians who have never had reason to complain in this respect, either through good luck or because they behave as befits their position, there are, on the other hand, other librarians who, through false modesty or pure stupidity, do not assert their rights as professionals or as human beings.

Personality is absolutely indispensable to the librarian. He must have the inner conviction that his profession is worthwhile, and above all he has to like his work. He must be enthusiastic, energetic, and happy in what he is doing; in a word, he must have a *positive attitude* (Lasslo, 1968). *Enthusiasm is contagious and works* marvels in the minds of other people. It must not be forgotten that all this must be coupled with studies already carried out and the acquisition of wide knowledge, for enthusiasm will be worth little if it lacks knowledge. Or could it be that the sad situation mentioned above is due to the fact that the doctor has come up against medical librarians who, let us assume, do not know medical terminology? Let us hope that this has been the case; for it is necessary to turn oneself into an expert, to become an expert with dedication and determination.

Another aspect which lends itself to the breakdown between reference librarian and doctor is when the vertical and horizontal delegation of authority in the library works badly. This occurs in libraries with a varied staff, where each person ought to have his duties clearly defined and keep to them, yet they do not. For when each and every one of the people who work in the library wants to give consultant service to the doctor or student who asks for it, the post of reference librarian becomes apparently superfluous and the service which the library affords is uneven. This may provoke the patience of even the most patient doctor, who needs the services of a professional, and not the goodwill of an amateur. The remedy must come from the head librarian, as soon as the reference librarian points out to him what is happening.

In libraries with a minimum staff of only two librarians this problem does not arise in any very definite form, but interference in one another's work must avoided. I do not want to give the impression that I am against co-operation the members of a library: it is enough to remember how much the reference depends on the cataloguing department. Co-operation and co-ordination sary, interference is not.

We have considered how attitudes on the part of the doctor and of the library have contributed to the unhappy situations to which I have referred. I am inclined to think that the doctor is the culprit, but that does not prevent my recognizing that there are still many measures that the library should adopt, and, if it is already doing so, these could possibly be improved upon. It is not in our power to change the habits of doctors, or to provide them with the necessary time to visit libraries, but we can examine our activities and frankly declare their usefulness in maintaining the contact between doctor and librarian on a good footing.

For example, those libraries which serve hospitals or are in a school of medicine could think about providing a bulletin service calling the attention of certain doctors to new material received by the library, without claiming that the bulletin covers the entire field; far from it: indubitably, the human element, the time available, etc., are inevitable factors which must be taken into account, but the part played by inventiveness is great when money is scarce. Besides, a bulletin of this nature brings the human touch into an atmosphere of erudition, since keeping in mind the subject of investigation which certain doctors are carrying out shows interest on the part of the librarian. Here the librarian is maintaining the relationship on a good footing, and probably the doctor will try to keep it so.

Some libraries may tend to shy away from making bibliographies, because they feel that *Index Medicus* is already providing such service, but let us remember that the element of time comes in here, an element precious to the doctor. If the library has as its norm not to make bibliographies, the reference librarian should try to change this rule. Is the library afraid of handing over to the doctor a bibliography with crassly stupid mistakes in it? If this were so, what does it matter? Let us just hope there will not be many mistakes. Rothstein (1961) is of the opinion that the reference librarian ought to forget his reticence and dedicate himself fully to giving information and reference services in a direct and wholehearted way, since he considers this to be the chief and most important duty of the library.

Finally, we ought to consider that a discreet campaign on the part of the library can make doctors esteem librarians more than they do currently. The system of public relations is as useful to a library as it is to a sewing-machine factory. Possibly it may be necessary to explain once again the functions of the reference service, to give a reminder that it is freely at the disposal of anyone needing it, to point out the professional successes of the librarians in the library in question, in fact, to call attention to the library, stressing those aspects of it most pleasing to the eye of the reader. This kind of action is a positive step which should be taken if and when the library is providing excellent service. Otherwise, it would be an atrocious mistake.

In conclusion, I will say that I believe it is very difficult to decide who is more to blame when relations between librarians and doctors are not going well. Both are to blame, and both should provide the means of remedying their faults. Cordial relations between librarians and doctors constitute an ideal in libraries in the service of the medical profession. Let us hope that a gesture of goodwill and comprehension on the part of the doctors will be matched by a high standard of service on the part of librarians. Let us have faith in the human qualities of librarians and doctors.

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2

classification and cataloging

medical documentation and the universal decimal classification

F.A. Sviridov and G.A. Lloyd

The opportunity to present a paper on the Universal Decimal Classification (UDC) before such a distinguished assembly of medical librarians and documentalists is perhaps an unexpected tribute to the viability of the sexagenarian UDC in modern documentation — unexpected, because the medical field is, alas, one of those in which UDC is least used and in which it has consequently tended to lag behind. This is a frank admission — perhaps too frank, but honesty at the outset seems the best policy, especially in medical circles — yet we believe that in the long run it can do more good than harm to a classification system whose institutional users are conservatively estimated at about 100,000. Granted that the biological and medical sections 57 to 61 need considerable revision, this does not seriously affect the main theme of this paper: that in the biomedical — as in other — fields, a modern information system (including libraries, documentation centres and abstracting services) must use an international 'switching' language like UDC to unify the otherwise incompatible special classifications or thesauri in use among the different peripheral centres and services.

UDC has come a long way since it was weaned from its Dewey parent more than 50 years ago, largely by the efforts of the two Belgian pioneers Henri LaFontaine and especially Paul Otlet, whose birth centenary we have recently celebrated in FID. These were men of vision, whose ideals of a world documentation centre may have been premature and naïve, but at least they saw the increasing need for action to cope with the advances of science and technology.

the 'information explosion' and its challenge

We live in an era of tremendous scientific and technological progress, the complexity of which may be gauged from the 400 or more new therapeutic agents made known each year and the 1,000,000 scientific and technical articles published annually — to name but two examples. No less imposing are the figures for machines (and their outputs), including new reprographic devices: there are about 200 different models of copying machines, while high-speed printing machines now have a capacity of up to 6 million characters per hour and the latest electrostatic printers are capable of 7 billion characters per hour!

No wonder then, that in this age of explosions — atomic, population, and other kinds — there is so much talk of the 'information explosion' and the accompanying diversification and specialization of knowledge, together presenting the world information community with a major challenge. Within each art, science, and technology, specialization is now so rife that workers in one relatively small field tend to become isolated from their fellow researchers in related fields — not least in the life sciences, biomedical and agricultural — just when today's enormous build-up of information displays the need for closer contacts and more interdisciplinary co-operation at both national and international levels. One could say that scientists know more and more in

continually decreasing special fields. For the biomedical sciences — having common frontiers with psychology and the social sciences, cybernetics and human factors engineering, with the earth sciences, agriculture, oceanography and aerospace research, with electronics, nuclear science and so many other branches of knowledge — the need for organized intercommunication of information is perhaps even greater than in most other fields. Raisig (1966) mentions that, of 1388 biomedical titles indexed in the *Current List of Medical Literature* over the years 1951-1960, 403 had never been cited, while of the 985 titles cited, 196 had been cited only once. Clearly, all this implies the need for skilful marshalling, for classification of the widest scope, whether we think in terms of conventional libraries and documentation centres, or of mechanization and computer-based information services.

general versus special classifications, thesauri, etc.

Inevitably, here, we come up against that perennial, not always fruitful argument: is it to be a general classification for all knowledge (with adequate biomedical sections embedded in the universal matrix), or a semi-special all-medicine scheme ('general' from the medical standpoint), or a medical-specialty scheme of optimal value to a smaller circle of specialists? The answer will depend, of course, on the purpose for which the scheme is intended, the scope covered, the retrieval recall and precision required, and so on.

Special classifications, constructed to serve particular subject interests, hence with more sharply defined and usually fewer facets than general schemes, can often make for greater precision and relevance in retrieval from the information store; yet they tend to give a poorer total recall, because the store may lack significant items from fringe sources which are better supplied in a general scheme. Moreover, like specialized thesauri, which also have the natural-language problem, special classifications in any multi- or interdisciplinary network usually present quite serious problems of overlapping interests and incompatible notations. In the medical field particularly, there is a veritable proliferation of more or less special schemes, almost every one of which is proclaimed the best by its proponents! Objectively, it may be conceded that some are now to be preferred by virtue of their use by major abstracting services (NLM for MEDLARS, EMCLASS for Excerpta Medica), by a world organization (the Barnard scheme in the WHO), or by an important national information service (as in the U.S.S.R.), but there are several other rather widely used schemes, like that of the Boston Medical Library, Cunningham, and C.A.N.DO (Classification Alpha-Numérique de la Documentation médicale, devised by a doctor, J. Chevallier), among the numerous special schemes covering the whole medical field or one of its specialties, with the probability of more yet to come!

One may well ask with Dr. Geneviève Nicole-Genty (Conservateur, Bibliothèque de l'Académie Nationale de Médecine), from whose excellent recent survey (1968) much of the foregoing material is drawn, whether this great profusion of classification schemes, like the number of drugs for treating the same disease, does not reflect on the value of most of them. Not surprisingly she concludes as follows:

Aussi, malgré la satisfaction que peut donner au bibliothécaire l'emploi d'une classi-

fication adaptée aux caractéristiques de sa bibliothèque, à la mentalité de ses lecteurs, l'adoption d'un système international est peut-être la solution de sagesse.

If by 'système international' Dr. Nicole-Genty meant a general classification like that of the Library of Congress (LC) or UDC, we would agree; but it seems that she is implying, rather, one of the widely known medical classifications like Barnard (WHO), EMCLASS or, most strongly, the NLM scheme, which indeed can be accommodated as sections QS, QZ, and W in LC, but can hardly be claimed as the best designed. Without entering further into the relative merits of these purely medical schemes, it must, however, be said that none — with the possible exception of NLM, and then only in combination with LC — appears to be comprehensive enough to cope with the numerous important fringe subjects mentioned earlier. Nor is it at all certain that any firm agreement could be reached — at least in Europe — in favour of one of these as the standard classification for any international information system or network that may eventually be established in the biomedical field.

An authoritative general thesaurus of biomedical and fringe-subject terms, developed from MeSH and/or Excerpta Medica's Master List of Medical Indexing Terms (MALIMET), could be an answer to the need for an international unifying scheme and would certainly be an essential adjunct to a general classification, but used alone it would leave unresolved, or only partly resolved, the problem of the incompatibility of natural languages. Moreover, it would scarcely persuade individual libraries, centres, and services to abandon their own special classifications, incompatible with each other in structure and notation.

an international unifying classification for a mechanized information network

Is it not possible, then, to go a step further and accept — at least as a supplementary unifying scheme, if not for internal use — an internationally recognized general classification (in its full range) like LC or UDC? These two, because of their organizational set-up, seem to offer the most advantages, especially if the idea of an eventual world information network is kept in mind, such as that envisaged by the ICSU-UNESCO Central Committee set up to study the feasibility of a world science information system (UNISIST). Despite its link with the NLM scheme, LC cannot compare with UDC in its detail, notational flexibility, and treatment of other branches of science and technology. Already there is mounting realization that re-classification from the Dewey Decimal Classification (DC), when necessary, could be to UDC rather than to LC, and in the new MARC II project the records provide space for UDC as well as LC coding. UDC has indeed many claims to be considered for the role of international unifying classification, but, before examining these in more detail, we may consider briefly its role as a 'switch language' — combined with a standard general thesaurus — in an international medical referral centre and service.

Such a centre would certainly have to be mechanized, for its main functions would be to build up and maintain an up-to-date inventory of the very many medical libraries and information services, their scope and interest profiles, and to serve as a clearinghouse or referral exchange for directing information enquiries; it would not,

of course, in any way replace the specific information functions of existing medical libraries and services like MEDLARS and Excerpta Medica.

A standard general classification like UDC would be essential as a switch language to overcome the incompatibility of the special classifications and thesauri used for the peripheral material; otherwise, for *n* classification systems *n*-1 inter-conversions or concordances would be required, or one of the *n* schemes arbitrarily accepted as the standard switch language, with consequent inadequate coverage of fringe subjects, and possible mutual recriminations later if things did not go well!

Mechanization would permit the production and maintenance of the necessary authoritative thesaurus of biomedical and fringe-subject terms by integration and extension of MEDLARS, MALIMET, and other term sources: it would provide alphabetical entry to the inventory file, serve as a control or check index to the general classification code-descriptors, and supplement these where necessary with further detail to any desired depth. The latter would be particularly valuable in conjunction with UDC, which could then be used at any level — full, abridged, or intermediate.

why udc as the standard unifying classification or switch language?

The FID and its Central Classification Committee (CCC) are convinced that UDC, despite its shortcomings in certain respects, is the most feasible general classification to ensure reasonable co-ordination and compatibility in any international network. Although some advantages over LC have already been mentioned, the main arguments in favour of UDC are its availability and wide use, its feasibility for mechanized information systems, and its organized revision facilities.

1. availability and wide use

UDC, available in many natural languages and editions of different levels and therefore suitable for co-ordinating mutually incompatible special schemes, thesauri, and subject- or descriptor-lists based on natural languages, is the most widely used indexing-retrieval language for science and technology today: conservative estimates put the number of institutional users at around 100,000 or more, most of these being in the U.S.S.R. and Eastern Europe, and in English- and German-speaking countries. It is also widely used in Spanish- and Portuguese-speaking countries, and recently its use has been recommended in France for university and technical libraries — other than medical! Even in the U.S.A., where general classifications other than DC and LC have hitherto made little headway, UDC is gradually being recognized, thanks largely to recent efforts by Rigby (1964*a*, *b*; 1965), Freeman (1964), Freeman and Atherton (1966; 1967; 1968*a*, *b*), and Perreault (1969*a*; *b*), mainly in connection with mechanization.

2. use in mechanized information retrieval systems

UDC has recently been shown to be usable — with relatively little adaptation and quite straightforward programming — as an indexing-retrieval language in mechanized information retrieval systems, on the basis of evidence from projects and

tests in the U.S.A. and elsewhere, notably from the American Institute of Physics AIP-UDC project under Freeman and Atherton (1966; 1967; 1968*a*, *b*) and from several papers delivered at the first Seminar on the Use of the UDC in a Mechanized Information Retrieval System held at Copenhagen in September 1968. 'There is no longer any doubt', write Freeman and Atherton (1968*b*), 'that the UDC can be used as the indexing language in a mechanized system. No barriers exist to the successful use of the UDC in either a batch-processing or interactive mode.' It is this significant development that has encouraged the FID more than any other to set about establishing an international UDC-based referral centre at its headquarters in The Hague, as well as mechanizing its UDC revision procedure.

3. organized revision and updating facilities

UDC is provided by the FID with the essential revision facilities to ensure that it is regularly updated and developed in line with the general growth of information, and plans are in hand to fit it for its role as an international unifying system covering all fields of knowledge. Through the CCC, with its expert members from 17 different countries, through some 20 or more special UDC revision committees (FID/C . . .), and through its classification department, the FID is able to keep updating and improving the UDC schedules by means of internationally circulated revision proposals (P-notes) and the semi-annual cumulative 'Extensions and Corrections to the UDC'. The revision committees concerned with the life sciences are:

FID/C 57/59 Biological sciences, botany and zoology
FID/C 61 Medical science
FID/C 63 Agriculture and animal husbandry

Fringe interests are covered by several other similar committees or individual experts.

Interest in any of these committees will always be welcomed, and names of *persons prepared to assist actively in* UDC *revision will be immediately communicated* to the relevant secretariat. It is, of course, the primary task of such committees to carry out routine revisions and updating, but if exceptional measures were found to be necessary to improve the classification of the biomedical sciences, these could be discussed at a special joint meeting (or series of meetings) of FID/C 57/59 and FID/C 61, so that agreed recommendations could be submitted to the CCC for final approval.

conclusion

Criticism has been, and still is, directed against UDC for its old-fashioned structure, lengthy notation, and insufficient faceting, as well as against the FID for their slowness to modernize the system: undoubtedly there is some truth in these assertions. No general or universal classification could satisfy all specialized interests, nor could its notation ever be as concise as that of a specially designed scheme for a limited subject-field. It is the firm conviction of the FID/CCC, and evidently the opinion of the thousands of users all over the world, however, that the important advantages of UDC, which we have tried to outline in this paper, far outweigh its disadvantages. Moreover, the FID's future programme opens up perspectives for

more rapid modernization of UDC terminology and schedules, which in the biomedical field could be assured of real success if the system were to be adopted more widely in new libraries and information centres and used as a supplementary unifying scheme where existing schemes are maintained. Particular stress is laid on the need for a dual UDC/thesaurus based system as a switching mechanism for international referral centres and a means of co-ordinating otherwise incompatible systems in a wider network.

Perhaps one might fittingly conclude by quoting from a paper by Pauline Atherton (1965) answering her own interrogatory title 'Is compatibility of authority files practicable?':

> *If one can learn anything from the past efforts at compatibility of authority files, these efforts were practicable because the following conditions existed...*
> *... there was an outward force driving two or more information systems toward a common goal and there was a willingness to make compromise...*
> *... there was an inward force to centralize in an outside agency some of the effort of file organization for the information system...*
> *Is the question answered? In great part, it appears that compatibility is as inevitable as harmony. But it depends on the workers in the field — just as harmony in music depends on the composer and the performers. Even though an orchestra may be following the same score, musicians can tune their instruments and play the music in such a way that they either achieve harmony or they don't.*

Maximum harmony, co-operation, and constructive effort are obviously essential if we are to achieve an integrated information network in the biomedical field. We hope that this paper may stimulate further discussion and perhaps serve as a small tuning fork to the medical information orchestra!

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medicine in the universal decimal classification: experience of the university library of münster, german federal republic

G. Böggemeyer

The University Library of Münster possesses a stock of one million volumes. I propose to discuss some of the points which have emerged from the use of UDC in the preparation of a systematic catalogue of the Medical Department of the Library.

This catalogue, which is in the form of a card index, contains at the present time about 40,000 titles. These are arranged in classes, systematic groups of 20-30 cards. The size of each class depends on the number of books in stock, and classes which grow too large are subdivided. Each class (not each title) receives a UDC notation. I hope to show you the value of a systematic catalogue based on UDC as a means of classifying medical literature in the most useful way.

'Medicine' has the UDC number 61. UDC is constructed on the hierarchical principle, *i.e.*, grouping proceeds from wider to narrower limits. Three-digit numbers, *e.g.*, 617, may embrace several distinct branches of medicine (Table I). At this stage the various branches are not individually numbered; Table II illustrates the system by which a distinctive number is allotted to each branch.

Because of the purely decimal character of the UDC notational system, only 10 groups can be formed at each stage of classification. These are not enough to keep pace with present-day expansion of knowledge. Advocates of UDC must produce evidence that this difficulty can be overcome. In our systematic catalogue differently coloured cards, showing both the title and the UDC number of the class, are used to indicate divisions. The importance of the UDC number is re-emphasized; it is an indispensable aid both to systematic classification and to alphabetical indexing.

The inclusion in class 61 of anatomy, physiology, and pathology (Table I) raises the problem of where to place items of medical literature which are concerned with all these aspects of a particular region of the body. In the explanatory text of the UDC it is recommended that such publications be classified under 616 and excluded from 611 and 612. For two reasons we consider this ill-advised. First, it places this type of material too far below specialized anatomical and physiological literature. Second, because overloading of a single class should be avoided as far as possible; it is absurd

Table I. *Primary classification of Medicine by the UDC system.*

61	Medicine.
611	Anatomy.
612	Physiology.
613	Hygiene. Care of Health.
614	Public Health. Accident Prevention.
615	Pharmacy. Pharmacology. Therapeutics. Toxicology.
616	Pathology. Clinical Medicine.
617	*Orthopaedics. Surgery. Ophthalmology.*
618	Gynaecology. Obstetrics.
619	Comparative Medicine. Veterinary Medicine.

Table II. *Clinical specialties and their UDC notations.*

616	Pathology. Clinical Medicine.
616-053.2	Paediatric Medicine (Paediatrics).
616.21	Disease of the Ear, Nose and Throat (Otorhinolaryngology).
616.314	Odontology. Dentistry.
616.5	Skin Diseases (Dermatology).
616.8	Nervous Diseases (Neurology).
616.89	Psychiatry.
617.3	Orthopaedics.
617.5	Surgery.
617.7	Ophthalmic Medicine (Ophthalmology).
618	Gynaecology. Obstetrics.

that a person using the catalogue should be obliged to search here, there, and everywhere for this type of information.

In our opinion it is better to classify comprehensive publications dealing jointly with anatomy, physiology, and pathology under three numbers, *viz.*, 611, 612, 616. Medical literature which deals only with anatomical and physiological aspects of the subject is given a notation combining the numbers for pure anatomy and physiology (since these cannot be completely separated). We use for this purpose the plus sign and not the colon, since in these cases it is best from the hierarchical point of view to place the combined symbol before the basic UDC number. It has been proposed (Petersen, 1966; Fill, 1966) that the plus sign should be discarded, on the grounds that the colon is equally appropriate; but we think that the best differential arrangement is to place a plus sign before and a colon after the simple UDC number. We also use the plus sign in connection with philology (Boggemeyer, 1968).

The special advantage of UDC is the possibility of expanding systematic lists by the use of linking signs and auxiliary numbers. Matter can thus be reduced to its elements and these reassembled according to their character and affinities by a process which can be described as analysis-synthesis (Fellman, 1967). Additions of digits to the basic numbers reflect various facets of the subject. A characteristic feature of Medicine is its constant reversion to some special viewpoint, that of, *e.g.*, in anatomy: teratology, embryology, histology; in physiology: histochemistry and physiological chemistry; in pathology: aetiology, semiology, therapy. Classification is essential; hence the development of auxiliary numbers for large areas of medicine. Difficulties have, however, arisen. In some cases two numbers have been allotted to one and the same subject: surgery has 616-089 and 617.5; orthopaedics has 616-089.23 and 617.3. This shows a complete lack of system, since in one code orthopaedics is placed after surgery, in the other before it. In the case of orthopaedics, 617.3 represents only the general aspect of the subject; special aspects are represented by 616 . . . (area of body) . . . -089.23. As for surgery, 617.5 is designated 'Surgery of individual parts of the body'. Paediatrics is not included in any of the primary UDC numbers. With the help of the category 'Patients', with the suffix -05, the subject can be found under 616-053.2. Table III shows how in the systematic catalogue of the University Library of Münster 616-053.2 separates the system-complex aetiology, semiology (diagnosis), and therapy. To appreciate the present position of paediatrics it must be understood

Table III. *Arrangement of Paediatrics in the UDC*.*

612-02	Aetiology.	
616-05	Patients.	
616-053.2	Paediatrics.	
616-053.2(0:001.1)		General.
616-053.2(0:01)		Bibliographies.
616-053.2(02)		Comprehensive works.
616-053.2(05)		Periodicals.
616-053.2(08)		Collective works.
616-053.2(091)		Histories.
616-053.2-071		Diagnosis.
616-053.2-091		Pathological Anatomy.
616-053.31		Newborn infants.
616-053.32		Premature infants.
616-053.34		Infants.
616-053.34-084.2		Infantile Mortality.
616-053.5		School children.
616-07	Semiology. Diagnosis.	
616-08	Treatment (Therapy).	

* *Classes according to the Systematic Catalogue of the University Library of Münster.*

Table IV. *Arrangement of classes of Veterinary Medicine in the Systematic Catalogue of the University Library of Münster (Column 1) and improved version (Column 2).*

619	Veterinary medicine.	619	Veterinary medicine.
619:614.23	Veterinary practioners.	619:63	Relation between veterinary medicine and agriculture.
619:616...	Special diseases of domestic and working animals.	619(02)	Comprehensive works of veterinary medicine.
619:63	Relation between veterinary medicine and agriculture.	619(03)	Dictionaries of veterinary medicine.
619:636.1	Veterinary treatment of horses.		
619:636.2	Veterinary treatment of bovines.	619(05)	Veterinary periodicals.
		619.1:614.23	Veterinary practitioners.
		619.1:616...	Special diseases of domestic and working animals.
619(02)	Comprehensive works of veterinary medicine.		
		619.1:636.1	Veterinary treatment of horses.
619(03)	Dictionaries of veterinary medicine.	619.1:636.2	Veterinary treatment of bovines.
619(05)	Veterinary periodicals.		

that 616-053.2 already embraces some 200 titles. Similarly, 'Odontology', 616.314, disturbs the class 'Diseases of the digestive organs', 616.3.

Veterinary medicine has the UDC number 619, so that any further classification entails additions to the code. Table IV shows how, by using the colon to indicate order of priority, special material is placed before general material. In the introduction to the new UDC medium edition (DK-Handausgabe, 1967) the two distinct functions of the colon are defined, so far as I know, for the first time. They are: 1. Co-ordination, the expression of an authentic relation; 2. subordination, the expression of an order of precedence. For correct systematic classification, the function of a colon must be indicated by its position, so that two different notations are required. The

second column of Table IV illustrates the way in which we have used the colon to establish a more rational order by addition of .1 to 619.

The Universal Decimal Classification is good in principle, at once strict and flexible: strict, because of its firm framework of systematic numbering; flexible, because it is open to adaptation by means of connective symbols and additional digits. Yet, as we have seen, it is not invariably successful in establishing a rational order of classification. A particular advantage of UDC is the periodical issue of Supplements. Unfortunately, these are not produced on a systematic plan, but deal at random with individual areas of medicine. The essential characteristic of the UDC is conservatism; alterations are made only when they are absolutely necessary, and are not allowed to disturb the existing structure. But this principle must not cause a clumsy and inelastic system.

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III

medical thesauri

M. Wolff-Terroine

From the end of the 19th century until some twenty years ago, of the many ways of recording information one heard talk of classification only. Medicine, like other disciplines, after having made use of the classification provided by encyclopaedias, found itself with a choice of specialized classification systems, such as Barnard, that of the Boston Medical Library, and, more recently, Cunningham, etc. Then suddenly one witnessed an explosion of specialized thesauri, and soon there was no centre of specific information that did not create its own thesaurus. One can even say that at the present time the word 'thesaurus' is a fashionable one: whoever records a list of recommended terms furnished with a few synonyms immediately calls it a thesaurus.

the nature of thesauri

To what is due this sudden appearance and rapid development of thesauri in information systems? In what way could this new mode of expression answer previously unsatisfied needs? In order to reply to these questions we need to place thesauri among other kinds of information retrieval language. Thesauri, in fact, came into being by way of contrast to two totally opposed systems: classification, and descriptor lists of the uniterm type.

Classification systems of a hierarchical structure are systems of logical classing, working along the lines of class inclusion, the narrower classes coming under the more general: there is one place and only one place for each concept represented. This, then, leads to the establishment of a systematic linear classification.

Descriptor lists are languages of documentation combinatory in form: concepts are arranged in alphabetical order, the order being entirely arbitrary from the logical point of view. But, by the intersection of the classes concerned, one has direct access to the concept desired. Related concepts are dispersed, but these multi-dimensional languages have great flexibility through the possibilities of association they offer (Fig.1).

Thesauri constitute a new type of documentation language to associate the combinatory flexibility of uniterms and the structural possibilities of classifications. Thesauri are designed to replace the macrostructure of classification by microstructure. For every word of the language of documentation, there is evocation of an environment, a *semantic field*. These microstructures must be fitted together (when the connections are obvious). One can thus conceive of a thesaurus as a systematic arrangement of all these linguistic and semantic microstructures. A thesaurus is therefore a structured language of documentation, but flexible in form and with combinatory possibilities; in it, a concept has not one place and one place only, but is defined by its environment and aleatory associations (Gardin, 1966; London, 1966; Wolff-Terroine *et al.*, 1969).

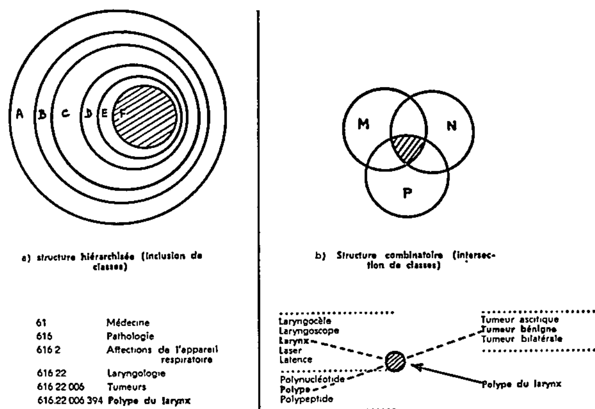


Fig. 1. Representation of a concept (polypus of the larynx) in a system hierarchical in type (a), and in a system of combinatory type (b).

functions of thesauri

The *control of vocabulary* constitutes the prime condition of all documentary systems. This control, which is easy to carry out and is practically non-existent in classification systems, where a concept is determined by its location, assumes capital importance in the combinatory systems in which a concept is represented by a word.

A thesaurus is, in the first place, a collection of terms with which concepts and objects belonging to the territory under consideration can be identified and indexed without ambiguity. The thesaurus must then reduce the synonyms to a common denominator, and analyse the frequent compound and complex terms to their constituent elements, *e.g.*, Hypercholesterolemia = hyper + cholesterol + blood. Certain ambiguities cannot be broken down except manually by analytical notes (scope notes). A thesaurus is therefore a definitive list of univocal terms formed from natural, but ambiguous, language.

Having been conceived, on the whole, for automatic use, thesaurus-type systems have their vocabulary control effected by a computer. The model list comprising all the preferred terms and accepted synonyms is compared with all the indexing terms contributed by the analysts. Synonyms are referred automatically to preferred terms; depending on the system used, the number of synonyms accepted for input can be either insignificant or, by contrast, very great. The same vocabulary control is carried out at the output when a question is formulated, to see if all the terms used in the

question conform to the model list. Consequently, the thesaurus represents a linguistic control of the input/output of an information system (Dovel, 1966).

As an *indexing instrument* the thesaurus, through presentation of the semantic field of each term, by means of its explanatory notes, is a constant aid to the indexer.

In *the formulation of questions for retrospective searching*, the thesaurus is an instrument which pre-eminently lends itself to this task. All related terms are generated, the whole semantic field of each concept entering into a question effecting various modulations as functions of the type of question under consideration. Some of these modulations can be carried out by computer: tracing a hierarchical tree, for example, to include more general concepts. On the other hand, the human mind, with its capacity for judgment, must establish some discrimination and fix a limit to the chain reaction of the related terms so generated.

Through the play of the combinatory power of the concepts and the possibilities of semantic and multi-dimensional structure, it is possible to define a search strategy for each question. In this way, it is hoped that the recall ratio of the information system can be increased. Through this helpful role during analysis and search, the thesaurus acts as a semantic and linguistic control over the whole documentation system.

typology

From the same basic concepts of the role and nature of the thesaurus, we can distinguish different *types* of thesaurus. They have, in fact, been compiled and presented in quite different ways, for the different kinds of exploitation they were designed for. A very rapid outline of thesaurus typology would divide them roughly into four main categories.

In the *purely alphabetical thesaurus*, ideas are not grouped or assembled conceptually: the concepts appear here in their most literal and simple form. Only the references to synonyms are given (*see* or *used for*).

In the *co-ordinated alphabetical thesaurus*, concepts are arranged alphabetically as in the preceding type, but each key word is followed by all the terms suggesting conceptual connections, either close or distant, with the basic key word. An example of this type is the EJC thesaurus. It is too well-known, with its presentation of the synonym connectors *use* and *used for*, the hierarchy connectors *broader* and *narrower terms*, and the environment connector *related terms*, for us to dwell on it here. This type of thesaurus, with its co-ordinated alphabetical structure, has served and continues to serve as a model for a great many specialized thesauri, particularly in the U.S.A.

In the *alphabetically structured thesaurus*, the greatest stress is laid on each concept. In fact, each key word comprises several associated ideas which adhere together. They are phrases which refer to other possible synonymous phrases. The words of the phrase assume indices of a conceptual hierarchy (Aries, 1966) (Fig. 2).

The *thesaurus with alphabetical list of concepts and representation of concept links by graphic methods*, relatively more frequent in Europe than in the U.S.A., has been created to offset a disadvantage found in thesauri: that microstructure, in fact, makes

SES, DOSAGE DU NA, K, CA PAR PHOTOMETRIE DE FLAMME, ET DU P PAR
ADDITION D'UNE SOLUTION DE CHLORURE DE CS. COMPARAISON D'UNE
BOISSON TEMOIN (ORANGE) AVEC BOISSON DU COMMERCE. 12 REF.)
- FABRICATION
.RAISIN
40557 (BUL. RESULTATS DE L'ETUDE SUR LA PRODUCTION DE JUS DE
RAISIN MOUSSEUX)

BOITES DE CONSERVE (VOIR AUSSI BOCAUX)
- ATMOSPHERE
40669 (PROCEDES RAPIDES ET EFFICACES POUR LA DETERMINATION
QUANTITATIVE DE LA COMPOSITION EN GAZ (O,H,N,CO2 ET CO) DE LA
PARTIE SUPERIEURE DES BOITES DE CONSERVE. CHROMATOGRAPHIE GAZEU-
SE. ETATS-UNIS. 12 REF.)
.GRAPEFRUIT
40716 (INFLUENCE DES DIFFERENTS TRAITEMENTS ET DES CONDITIONS
DE STOCKAGE SUR LA QUALITE DU JUS DE GRAPEFRUIT ET SUR LA CORRO-
SION DES BOITES. DESAERATION, INHIBITRICE DE CELLE-CI. L'ESPACE
LIBRE DES BOITES A UN EFFET DEFAVORABLE SUR LA COULEUR, SAVEUR
ET CORROSION. ISRAEL. 14 REF.)
- REVETEMENT EXTERIEUR
40462 (FR. ETUDE DES DIFFERENTS PROBLEMES POSES PAR LES EMBAL-
LAGES EN FER-BLANC. PROBLEMES BACTERIOLOGIQUES. PROBLEMES DE
CORROSION EXTERNE ET INTERNE. INFLUENCE SUR LA SAVEUR ET LA COU-
LEUR DES CONSERVES. PROBLEMES TOXICOLOGIQUES. 44 REF.)
- REVETEMENT INTERIEUR
40462 (FR. ETUDE DES DIFFERENTS PROBLEMES POSES PAR LES EMBAL-
LAGES EN FER-BLANC, PROBLEMES BACTERIOLOGIQUES, PROBLEMES DE
CORROSION EXTERNE ET INTERNE, INFLUENCE SUR LA SAVEUR ET LA COU-
LEUR DES CONSERVES. PROBLEMES TOXICOLOGIQUES. 44 REF.)

BORE (VOIR AUSSI A ANTISEPTIQUES PRECISES, A FONGICIDES PRE-
CISES, A HERBICIDES PRECISES, A INSECTICIDES PRECISES, AINSI
QUE -ALBOTENE A ANTISEPTIQUES PRECISES ET ENGRAIS BORES)

Fig. 2. Extract from the index of the 'Fruits' Review of the French Institute of Fruit Research (IFAC).

		+ URANIUM OXIDES
49	EPILATION	USE HAIR + RADIATION INJURIES + SKIN
19	EPILEPSY	USE DISEASES + NERVOUS SYSTEM
	-EPIPHYSIS	SEE BONES OR PINEAL GLAND
10	EPITAXY	USE CRYSTALLIZATION
30	EPITHELIOMA	USE CANCER
69	EPITHELIUM	USE TISSUES
	-EPITHERMAL CRITICAL EXP. LAB.	USE ECEL
1,066	EPITHERMAL NEUTRONS	
1	EPITHERMOS-CODE	USE PROGRAMMING
3	EPITHET-CODE	USE PROGRAMMING
111	EPOXIDES	SEE ORGANIC OXYGEN COMPOUNDS OR PLASTICS OR POLYMERS OR RESINS
	EQPLT-CODE	USE PROGRAMMING
154	EQUATION OF STATE	USE THERMODYNAMICS
21,543	EQUATIONS	
51	EQUATOR	USE EARTH + ZONES
242	EQUILIBRIUM	SEE REACTION KINETICS OR STABILITY OR THERMODYNAMICS
6	EQUIPOISE-CODE	USE PROGRAMMING
32	EQUIVALENCE PRINCIPLE	USE RELATIVITY THEORY

Fig. 3. Extract from the alphabetical list of the Euratom thesaurus.

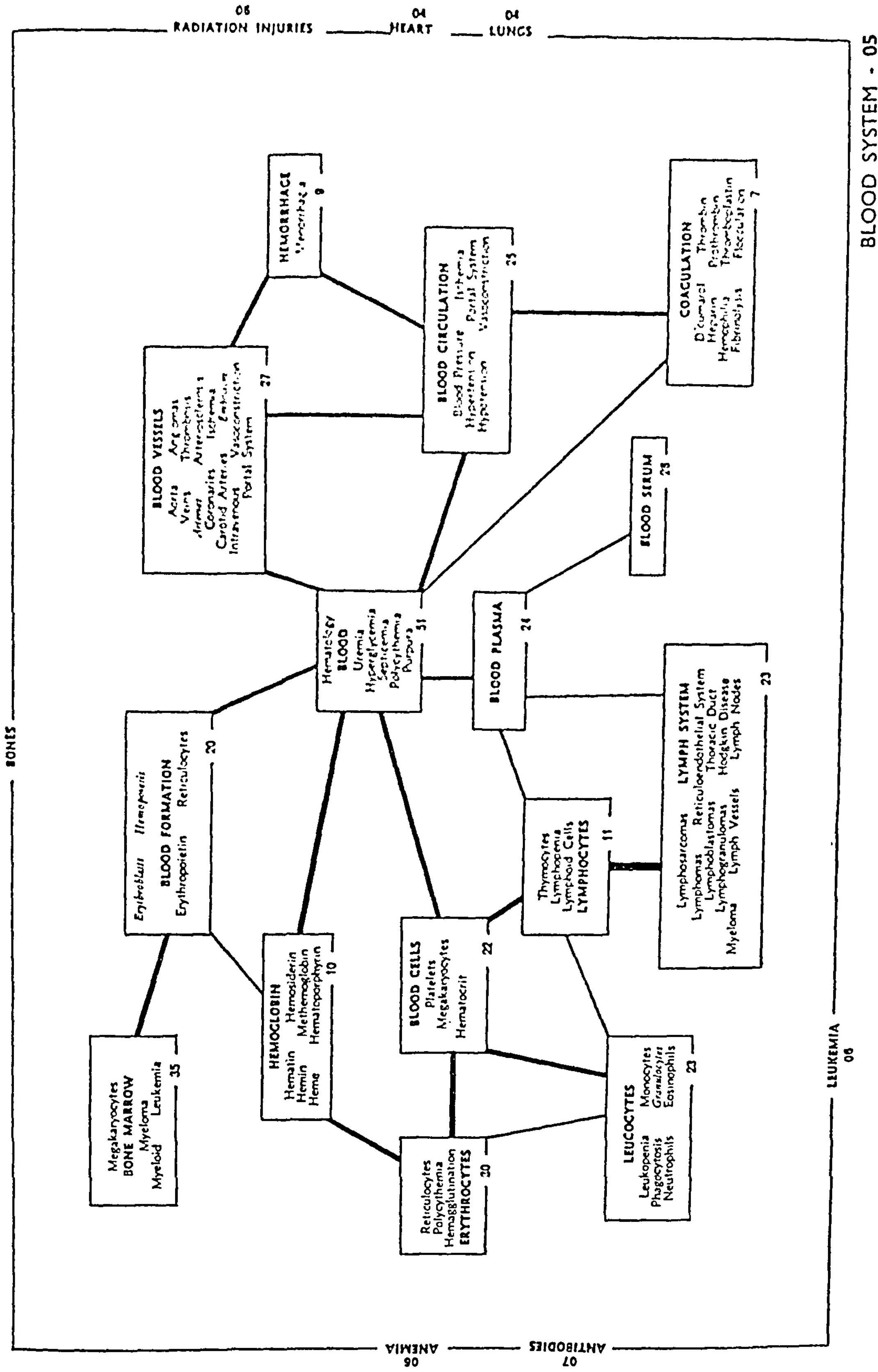


Fig. 4. Extract from the synoptic images of the Euratom thesaurus.

all horizontal term connections very conspicuous, but it does not allow vertical access beyond the hierarchical terms immediately below or above. Even with a computer, vertical expansion of the hierarchy does not give a synthetically combined view of all the vocabulary contained in one of the territories covered by the information system. Thesauri of the Euratom type (Figs. 3 and 4) have been created to fill this need by distributing the vocabulary of the system in a certain number of the territories: for each territory, a map shows the totality of the terms contained; coloured arrows indicate the conceptual connections, with the colour intensity of the arrow indicating the strength of the connection (Euratom, 1966; 1967).

We could include here the *faceted thesaurus*, but this is more akin to faceted classifications than to thesauri, properly speaking.

medical thesauri

Do many medical thesauri exist, and, if so, in which categories can we place them? In order to answer these questions, an investigation was made of the big medical information services, limited voluntarily to the mechanized or automated information services on the basis of the list of biomedical information centres given by the OECD for its Biomedical Panel.

Compared with the astonishing growth of thesauri in industry and in the American federal agencies, medicine has so far been relatively little affected by this type of language documentation. If the 'great ones' in information science — the National Library of Medicine and Excerpta Medica — have created thesauri, biomedical

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ABANDONED
ABATE
ABATEMENT use abate
ABATTOIR use slaughterhouse
ABOLISH
ABOLITION use abolish
ABRADE use abrasive
ABRASIVE
ABSENTEEISM
ACCESS
ACCIDENT
ACCIDENTAL use accident
ACID
ACIDIC use acid
ACT use law
ACTIVATED CARBON
ACTIVATED CHARCOAL use activated carbon

SOLID WASTES INFORMATION RETRIEVAL SYSTEM
            THESAURUS
```

Fig. 5. Extract from the thesaurus of the Solid Wastes Information Retrieval System.

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ANTIRICKETTSIAL AGENTS
     XX  GERMICIDES
     XX  RICKETTSIAL DISEASES
ANTISEPSIS
     XX  STERILIZATION
ANTISEPTICS
     SEE GERMICIDES
ANTISERA
     SEE IMMUNE SERA
ANTISPASMODICS
     SEE UNDER MUSCLE RELAXANTS
ANTISTAPHYLOCOAGULASE
     SEE UNDER ENZYMES INHIBITORS
ANTISTREPTOLYSIN O
     SEE ALSO STREPTOLYSIN O
     XX  IMMUNOLOGY.ANTIBODIES
     XX  STREPTOLYSIN O
ANTITHROMBIN
     SEE UNDER BLOOD COAGULATION
ANTITHROMBOPLASTIN
     SEE UNDER BLOOD COAGULATION
ANTITHYROID COMPOUNDS
     SEE ALSO ANTITHYROTOXIC FACTORS
     SEE ALSO DIIODOTHYROACETIC ACID
     SEE ALSO GOITRIN
     SEE ALSO HYDROXYDIIODOBENZOIC BUTYRATE
     SEE ALSO 1-METHYL-2-MERCAPTOIMIDAZOLE
     SEE ALSO PROGOITRIN
     SEE ALSO THIOUREA
     SEE ALSO THIOURACIL
     SEE ALSO THYROXINE ANALOGS
     SEE ALSO TYROSINE ANALOGS
     X   GOITROGENS
     XX  THYROID GLAND
     XX  THYROID HORMONES
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Fig. 6. Extract from the Medical and Health Related Sciences Thesaurus of the National Institutes of Health.

disciplines have been, more than other scientific disciplines, faithful to traditional methods. However, the situation is in the process of changing rapidly, following the introduction of information systems in medicine proper. It is becoming obvious that in making a collection of the findings of autopsies or diagnoses of illness, the semantic and linguistic organization of the thesaurus is best adapted to this kind of work.

Among medical information services making use of thesauri, many use the first kind of thesauri, *i.e.*, a simple alphabetical list with synonyms (Fig. 5).

The *Medical Subject Headings* (MeSH) of the U.S. National Library of Medicine (1969) are linked with thesauri of the EJC type. We can, however, note the characteristics which differentiate them from the mass of thesauri of this type.

1. The very slight number of synonyms, undoubtedly due to the centralization of the analysis.

2. The small number of related terms.

3. The presence of subheadings, facets indicating the main point of view from which the subject is treated.

4. The re-grouping of the terms of the documentation language in accordance with a certain number of categories.

It is very easy to see here the terms of immediately lower hierarchical degree; on the other hand, we have no good general view of levels at a greater distance from the lower hierarchy. In any case, the presence of synoptic images, even imperfect ones, is a big improvement over the mass of earlier thesauri.*

5. The sometimes inconvenient separation of ideas connected conceptually which, however, have no obvious connection at thesaurus level; for example:

Chromosome: Cat A 11
Chromosome mapping: Cat E 5
Chromosome abnormalities: Cat C 16
Chromosome aberrations: Cat G 1

are completely unrelated with one another.

Whatever its defects, MeSH represents an enormous effort to standardize medical language. Given the very important role played by the NLM with MEDLARS and *Index Medicus* in the dissemination and searching of medical information, several specialized thesauri, for example, the thesaurus drawn up by the American Diabetes Association, have come into being in the U.S.A. as a result of MeSH, thus establishing the microthesaurus as a standard. Others have laid down as an opening postulate the necessity of their compatibility with MeSH, for example, that of the Vision Information Center.

One could further quote the thesaurus used by the U.S. Public Health Service (1963) (Fig. 6) to index all the work in progress for which government grants are given (here we notice the importance of the number of *see also* references), Lunin's thesaurus for the Information Center for Hearing, Speech and Disorders of Human Communication, etc.

Excerpta Medica has also adopted for its documentation system an alphabetical

* Since the writing of this article, the NLM has published 'tree structures' for MeSH, correcting this deficiency.

thesaurus of the EJC type. Its essential characteristic is, through the play of synonyms and various ways of writing, its high number of accepted means of entry; one term can present 10 to 20 synonyms. On the other hand, environment is limited to the concepts of a lower or higher hierarchy; related terms do not seem in any way anticipated. One can say, therefore, that the language is very rich since it is declared to have some 40,000 preferred terms. We could link with this model the thesaurus that Oeff in Berlin is compiling on nuclear medicine.

Among medical thesauri, RINGDOC should be mentioned, which gives great importance to definitions of the terms employed.

The thesaurus made at the Institut du Cancer Gustave-Roussy is connected with the mixed thesaurus, which uses an alphabetical list of concepts and graphic representation of synoptic images. Here also there is an attempt to associate microstructures at the level of each category. This thesaurus, used in the SABIR system, is described by Rimbert *et al.* (this volume, p. 172).

Structured thesauri are not, to our knowledge, represented in medicine. As for faceted thesauri, these are quite well represented in Germany by Scheele's thesaurus (1967) for all biological sciences, and Schneider's (1967) for ophthalmology.

We see, through this very rapid review of medical thesauri, that such language documentation is of late development and has been followed by rapid growth. Their fundamental qualities for documentation have quickly subjected them to automatic systems. They remain, however, liable to a sometimes anarchic development, which is not without its drawbacks when one considers the compatibility of different systems. Is the anticipation of an area of knowledge served by a macrothesaurus to which a great many microthesauri could be connected a utopian dream? We could in this way have very flexible and at the same time compatible systems. This would suppose a wisdom greater than that of nations on the part of those who administer information systems. However this may be, it seems to us that it is along these lines we should work, that we should study the related aspects of information systems boldly to facilitate access and free circulation of medical information throughout the world.

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document analysis

Th. P. Loosjes

This lecture has been announced as *Document Analysis*, a title which does not sufficiently describe what I have in mind for discussion this morning. For a clearer delineation of our theme I would suggest the term *document content representation*. Thus we may first ask the logical question: *where* and *why* this representation?

document content representation in information storage and retrieval systems

First, *where:* representation takes place *in* our information storage and retrieval systems.

However sophisticated a system, however expensive or acclaimed a computer, they cannot serve the enquirers without an intelligent input, a thoughtfully built up document content representation. The root of success of all information storage and retrieval systems lies in this document content representation. 'The quality of the information storage and retrieval systems can only be as good as the quality of the document content representation', says Taulbee (1968).

Every information storage and retrieval system has two levels of organization: the organization of the document content representation and the organization of the file. I will confine my remarks to the first level.

storage of complete texts in information storage and retrieval systems

Having answered the *where* of document content representation, we may turn to the *why*. But why only a *representation*? Why not put the whole document in the information storage and retrieval system?

Results of experiments on computer-memory storage of whole documents in information storage and retrieval systems have been published (Salton, 1968). The input in such systems is thus cheap, because document content representation is rendered superfluous. This low cost of input must, however, be gauged against the expense of output: a search of a whole-document store can only succeed if the question is formulated in the terms of the sought document, but, since the terms used in the document constitute an unknown in the search procedure, all conceivable words which might have been used in the language of the stored document must be used in retrieval.

The fact is that living language — because it is living — escapes every attempt we make to standardize it for improving our manual or mechanical matching of enquiries with document texts. Moreover, the matching ability of a computer is nowhere near that of a person reading intelligently.

Another difficulty of retrieving information from a store of integral texts is that success depends on the language of the stored texts. If this language has the precision of chemical or mathematical formulae, scanning may succeed. But searching a text with *implications*, such as a literary essay, will give poor results, because implications depend on meanings *between* the lines (connotation) rather than meanings explicit in words *on the lines* (denotation). *The more explicit the language used, the better the*

retrieval will be; a rise in the number of implications means a decrease in retrieval effectiveness. In practice, this means that storage of complete texts should be more successful in natural sciences and technical disciplines than in the humanities and social sciences. These problems of exact sciences versus social sciences and humanities are also common to automatic indexing, extracting, and abstracting.

the users' and producers' approach

Sharp (1965) summarized the problem as follows: 'The fundamental problem which is common to all is that of providing for the *nearest possible coincidence* between the *description of a subject by a searcher* and the *description used to enter documents* on that subject in the system' (emphasis added). In other words, document content representation as it is approached by the *user* of the information storage and retrieval system and as it is approached by the *producer* of the system must be made to correspond as closely as possible.

Producers and distributors of scientific literature, thus the generators of the document content representation, include authors, editors, publishers, information and abstracting services, and library cataloguers. Users of scientific literature include researchers, bibliographers, and documentalists searching literature for other users. These two directions of approach, the producers' and the users', may be characterized by giving two typical points of difference: predictability of patterns of enquiry and acceptance of complete documents as units of information.

The first point of difference between producers and users is the predictability of the patterns of enquiry. Producers usually have only very vague and obscure ideas about the generation and use of content representation of the documents they produce. Their activity is discipline-oriented and the nature of their enquiries, given the range of producers' activities, is hardly predictable. However, the users know, we hope, roughly what they need. Their activity is mission-oriented and their patterns of enquiry are generally predictable. Users' needs are more predictable in retrospective searching than in reading for current awareness.

The second point of difference is the acceptance of the document as the unit of information, *i.e.*, the book, the journal article, or any form in which it is published. This acceptance is normal for producers, but users tend to be interested in only a part — perhaps merely one paragraph, subsection, or even one sentence — of the published document. I suggest the term 'microtheme' for that part of the document which interests the user.

document segmentation in the producers' approach

Microthemes are not used by producers of information storage and retrieval systems because the document is usually accepted in its published form as a unit of reference. Exceptionally, the producer may use so-called links between descriptors, which indicate if two descriptors occur together in a certain part of the document; he has then taken a step towards segmenting the document. These links are suggested as a means of avoiding noise in the search procedure. Without links or segmentation into microthemes, all descriptors are presumed to be related to the whole document,

though in reality only descriptors A and B, or C and D, may be related to any particular microtheme. However, many documentalists brush links aside as superfluous sophistication.

the microtheme as a unit of reference in the users' approach

The user often makes his own document content representation in a private file. Every research worker, documentalist, or literature searcher does this document content representation at some time during or after reading professional literature. But what does he really write down for himself? A few lines, perhaps one whole paragraph, a short abstract of the paragraph, or merely a few descriptors. He may also transcribe or reproduce one or two pages, but he rarely needs the whole document as published. From this activity a literature reference may ensue when he writes a paper.

A literature reference indicates to the reader either where he can find *a more elaborate discussion* on the theme or where he can find *support for the author's arguments*. The former is a typical literature reference, while the latter is more a citation. The literature reference may point to the article as a whole, but often only refers to a certain part; the citation never points to the article as a whole. I will not further consider those literature references leading to complete articles for further reading, but will confine myself to the majority of literature references, which are true citations. These refer to one part, a particular sentence or paragraph, *i.e.*, what I have called a microtheme. But in the literature reference ordinarily found at the end of a scientific paper, always the whole paper referred to is mentioned, which blurs the factual situation.

Although this way of making references referring to complete documents is common practice in the natural sciences and in technology, citations in the humanities usually refer to specific pages, perhaps because the average publication in the humanities is longer, often in book form. A citation to a book of 200 pages gives the reader little guidance, necessitating a page reference. In science and technology, most research is published in short articles in periodicals and the specific page reference is usually omitted.

Every publication is constructed with microthemes as building units. If the publication is well laid out, these microthemes stand out as separate sections. Careful layout and distinct segmentation will often influence the ease of document content representation and its resultant quality.

the anatomy of the document

The microtheme is the primary building unit of a publication. The anatomy of a publication consists of a design of the various microthemes and their mutual relationships. Occasionally, authors themselves provide this design or model. For example, an article about the Dutch tomato market and the internal and external influences causing fluctuations on that market, written by Meulenberg and published in the *Netherlands Journal of Agricultural Science* in 1966, gives a diagram of its microthemes with their mutual relationships. A research worker collecting data only about the fluctuations of the price of tomatoes on the British market would need but a small part of this publication, one microtheme.

the histology and cytology of the document

I have used the expression 'anatomy' of the document on purpose. Anatom rather rough approach if you think of the histology or cytology of the docu Anatomy in this context means the choice of indicative words which can serve useful representation of the content of one paragraph. Histology would mea presentation of every sentence; cytology, of every word. Such a division betwee anatomical, histological, and cytological levels relates to the optimum dept indexing, to which I shall return later.

users' methods of enquiry

How does the user present his frame of reference for studying the litera Two situations are typical:

He has a *mental picture* of the microvocabulary of the descriptors which out his subject. This is the normal situation: scanning the literature against subject frame, he chooses microthemes out of documents, which he copies by ha by reprography.

What he has in mind is defined by a *written profile* which he gives to an informa service for selective dissemination of information within a current aware service, often mechanical, where users' profiles are screened against the newly rece literature. The results are indications to users of what new literature falls within profile.

A third kind of formalization of the frame of reference is a *written formula* o kind of descriptors and their mutual relationships that the user is interested i striking example of this approach is the interesting experiment of Selye and his c borators, who launched the SSS (Symbolic Shorthand System) (Padmanabhan Ember, 1962). As this is in the medical field, I presume that you are familiar with system.

In the SSS there is a curious mixing of a descriptor language from the produc point of view and a method of document content representation from the users' p of view. It was originally meant for general use as a descriptor language in medic Subsequent practical use showed that it was often successful when used by a spe research group interested in specialized areas in pharmacology and endocrinol It is thus best considered as a method of standardized document content representat for a specialized user group.

My conclusion from these remarks about the users' approach is that the wants a very clearly articulated, well-structured presentation of the document its the microthemes should stand out. He is interested in the divisions of the docum as it is published. The more the document content representation is built on mic themes, the better will be the 'relevance' and 'recall' which Cleverdon (1962) took criteria for evaluating an information storage and retrieval system. This means tha document of 5 pages with 25 microthemes would appear in the information stor and retrieval system not as 1 item but as 25. But such multiplication of the numbe entries by 25 is little problem for computers and their memories.

User interest profiles are specific and indicate a high level of predictability enquiries. The user always handles his own microvocabulary implicitly or explici

It matters little whether his profile and the document content representation are matched by machine or not. However, the more formal the language of both the document and the searcher's enquiry pattern, the more successful mechanized matching can be. The users' approach must be linked to the producers' approach. By comparing how they each approach document content representation, we should be able to improve our systems.

producers' methods of approach

Stevens (1965), in his discussion of the producers' approach, classified the methods of document content representation into those using *derivation* and those using *assignment*. Derivation takes descriptors from the text without vocabulary control; assignment takes descriptors from an established list so that vocabulary is controlled. I would consider two further methods: *abstracting*, which usually combines both derivation and a sort of assignment based on precepts; and *free indexing*, which allows derivation of descriptors together with the use of any other words of natural language.

The method of derivation can be further differentiated into *derivation of words* only and *derivation of complete sentences*; transitional methods also exist.

derivation

In the method of *derivation of words*, words are chosen from the document without any control of vocabulary. This is, in fact, a kind of indexing restricted to words occurring in the text. Such restriction increases the effort and cost of retrieval. The input is simple, consisting only of words in the document marked for use as descriptors.

Luhn (1957) suggested a mechanical approach to input by use of word-frequency statistics as a basis for choosing descriptors, a method which he later modified for the co-occurrence of word pairs within a certain vicinity of each other in the text. This is a kind of machine-aided indexing.

Another approach is automatic indexing, by which the computer is programmed to omit certain general, or function, words carrying little information by supplying the machine with an antidictionary. The rest of the words are then descriptors for indexing. Recent research (*e g.*, Sharp, 1967) has made us sceptical about the possibilities of success of this method.

The method of *derivation of sentences* may be done manually, usually by extracting a block or blocks of sentences with the help of some form of reprography. It is also clear that machine-aided methods have possibilities for this kind of derivation. The selection of sentences may be done by application of the following methods.

Statistical methods use a direct deduction from the statistics of word occurrence or of co-occurrence of word pairs. A machine selects sentences by the frequency of occurrence of words within sentences of the text. Sentences with four or more highfrequency words would be preferred to sentences with a lesser number.

With *linguistic methods* the machine selects sentences of a certain syntactic structure, *e.g.*, those beginning with a subject modified by attributives, or sentences

with particular expressions in the text, *e.g.*, those containing 'conclusion is . . .' These structures and/or expressions must be programmed in advance.

Methods based on *textual form* include, for instance, a special place in the text (headings, captions) and special typographical details (indentation, bold face, italics).

Much research has been done on the selection of sentences, but Sharp (1967) reports that the results so far are disappointing.

These methods of choosing sentences have been called 'automatic abstracting', but it is clear that they are really 'automatic *ex*tracting'. We will use the term 'abstracting' later in the discussion, in cases where a document content representation involves a critical choice.

Thus far, the derivation of sentences has been treated with the idea of *choosing* sentences from the document. It is also possible to conceive methods of *condensing each* sentence to a derivate (document histology). This takes us into a kind of mechanical translation, whereby each sentence is standardized or condensed for document content representation. It is therefore not so astonishing to hear of congresses organized for both documentalists and people interested in mechanical translation, not so much to learn about each other's work but, rather, to learn from each other's methods.

A special manner of derivation of sentences is the derivation of one sentence only: the *title sentence*. This is the basis upon which some KWIC indexes are built. In current contents methods, the title is likewise the only part derived from the publication. But the difference is that in current contents situations the titles of the papers are reproduced as they appear in the contents list of the journal issue. The KWIC index provides the user with additional searching aids by permuting the title for all possible search words contained in it.

In all methods of derivation, searching is more cumbersome than with methods of assignment. The lack of vocabulary control leaves the user uncertain in many situations.

assignment

In methods of assignment, the words for document content representation are derived from a prepared vocabulary of descriptors, *i.e.*, a *thesaurus* or an authority list. 'Thesaurus' can be defined as a controlled vocabulary of an indexing language.

The producer making such a thesaurus must have some idea of the vocabulary of the user. The more specialized the subject, the more the producer needs to adapt the vocabulary to the user group. If the producer is a commercial publisher, the number of users must be above a certain minimum; if he is a cataloguer, he can adapt his catalogue for the special use of only one or two people.

The microvocabulary of the research worker can also be called his *microthesaurus*. The microthesaurus is based on his or his, literature searcher's, pattern of enquiry. On the other hand, the *macrothesaurus* of the producer is a frame of reference which the producer deems acceptable for the user. It would be possible for editors of specialized journals and abstract media to produce an *editorial thesaurus* (or 'home thesaurus') of preferred terms for authors' and abstractors' use, a practice, as far as I know, not yet applied. Editors could thus control the vocabulary in certain special fields, aiding the process of standardization of terminology and thus improving communications and

certainly improving document content representation. In this way, vocabulary control is shifted from the production of document content representation to the production of the document itself.

One of the main problems is the *internal organization* of the thesaurus. If short, there are no pressing problems. But the longer the thesaurus, the more structure becomes desirable.

The first elements of internal structure are the *see* and *see also* references; more elaborate are the thesauri including NT (*see* narrower term), BT (*see* broader term), and RT (*see* related term), which constitute a signal pattern leading the searcher along a more complicated search strategy. These signals, however, fall short of hierarchical classification, as the local and global forms of hierarchy are defined by Hayes (1968).

Other examples of the introduction of structure are facet classifications and the use of relators (formalization of all possible relations between terms). The extreme organization is the well-known hierarchical classification, as exemplified by UDC *with its primary dependence on general to specific relationships.*

At the 1964 Elsinore Conference of classification experts, theorists defined the term 'classification' in this way: 'By classification is meant any method creating relations, generic or other, between individual semantic units, regardless of the degree in hierarchy contained in the systems and of whether these systems would be applied in connection with traditional or more or less mechanized methods of document searching' (Atherton, 1965, p. 544).

I repeat: *any* method of creating relations, which means any application of structure in a list of chosen terms I do not know if the Elsinore formulation will bring lasting peace from the ancient battlefield of classifications versus alphabetically arranged subject headings. But it does point to the great range of possible descriptor languages, from the very informal to those with a rigid hierarchical structure. Hopefully, the Elsinore definition should bring an end to the polemics.

Structure in a vocabulary is a helpful device for searchers. This help is virtually proportional to the amount of structure introduced into the vocabulary. A hierarchical classification gives most help (though perhaps a biased help), facet classification less, and reference to broader, narrower and related terms still less. The introduction of syntax (*e.g.*, role indicators) is certainly a helpful device for searchers. More structure means more help and less need for initiative in search strategy; less structure means less help in searching and more need for initiative, but also more freedom in formulating a search strategy.

To avoid being judged too neutral in my review of this ancient battleground, I would add that a *rigid hierarchy* has two principal disadvantages: the meaning of descriptors is only comprehensible in context; and a hierarchy of the criteria for subdivisions is built in, unlike a facet classification.

How is a thesaurus built? A thesaurus may be constructed from a list of ideas originating in an expert's mind or a standard handbook. It may also be derived from a representative collection of documents. Recently, sifting through a collection of documents has often been done by machine. This is a statistical aid in thesaurus building which analyses the frequency of use of descriptors in the documents. Such an inductive approach leads to the inclusion of the co-occurrence of words, the mapping

of word families or word clusters, and their diagrammatic representations. Rolling's excellent discussion (1965) suggests various diagrammatic representations.

Document contents are usually matched against a thesaurus without mechanical aid, but a computer may also be used. If so, the full text of the document is processed in the machine, which has been programmed with the thesaurus. The result of matching text with thesaurus is a list of indexing terms suitable for retracing the document. This method of automatic indexing based on a prepared vocabulary differs from the method of automatic indexing previously mentioned, which was based on computer comparison of a text against an antidictionary. The tendency now seems to be towards development of vocabularies for assignment rather than use of methods of derivation.

One of the most recent reviews of descriptor languages for information retrieval is contained in the second chapter of Meadow's book (1967). He first gives diagrammatic schemes of the basic logic of various kinds of information retrieval languages, and then proceeds to evaluate these languages for expressiveness, possibility of ambiguity, compactness, and cost. He makes a principal division between vocabulary and syntax, which is equivalent to our division into descriptors (derived, free, or assigned) and structure.

abstracting

Abstracting largely draws upon words used in the document itself. In this sense abstracting is a method of derivation. However, abstract journals always supply their abstractors with stringent instructions. There is an element of assignment in this. There is no fixed list of descriptors, but there is a fixed technique of document content representation: *e.g.*, to include conclusions and results, to mention methods, to exclude descriptions of experiments and discussion of the literature. Such a manual of what to select is a normal feature in the larger abstracting services.

Two problems are especially relevant to document content representation: 1. Is an author abstract preferable to a non-author abstract? The author abstract is more economical, but should be checked by the editor of the journal in which it will be published. This should remove the idiosyncracies of an author abstract. The editor may even check the words used in author abstracts against a vocabulary of preferred terms. 2. For non-author abstracts, Borko and Chatman (1963) found that instructions of abstracting journals are nearly all alike. However, up to five different journals may abstract the same chemical paper differently (Schüller, 1960). The five different abstracts *in combination* gave an excellent product. Variations in the abstracts may be caused by unclear structure of the original and by different disciplines of the abstractors (*e.g.*, biochemist, physical chemist).

A special kind of collective abstract on a specialized narrow field is the *critical review*. These reviews are often brought together in annual volumes. Practice has shown that these annual reviews are commercially a success, in contrast with the majority of abstract journals which generally need subsidies. The reason for this is that abstract journals process and store large amounts of material, while authors of critical reviews generally process and store only a few of the publications by selection according to quality, a process which rejects the many superfluous and duplicatory

publications of all sorts issued more for social reasons than for communication. These critical selections are welcome as an alternative to the personal sorting and reading of many new publications, provided that the author of the annual review article is an acknowledged authority. In future provision of literature these annual reviews will undoubtedly play an increasing role (Symposium on critical reviews, 1968).

free indexing

The methods of free indexing are free from both original texts and rigid prescriptions. However, most of these free indexing methods include some kind of prescription, though only of a very general nature, *e.g.*, how many descriptors to use, whether to relate the descriptors syntactically, or to use certain word forms (*e.g.*, verb or substantive; substantive or adjective; plural or singular). Though the choice of the descriptors is free, most of them do occur in the document anyhow. So the result is a mixture of derivation and free choice. It is also called 'enriched indexing' because it enriches the original vocabulary of the document. Incidentally, the index for one independent book is always made by free indexing, as consistency is no problem from the producers' approach.

document preparation

Document content representation may be improved by producing original documents whose logical and typographical arrangement simplify document content representation and raise its reliability and consistency with the original document. This applies to both manual and machine operations. Important elements of presentation of a publication from our standpoint can be summarized as follows:

The *lay-out* should be a clear typographical presentation of the various components of the document, indicating abstract or summary, discussion of experiments, discussion of relevant literature, conclusions, purpose of study, etc. These different parts of the document could be indicated by a system of typographical signs (Maltha, 1965). Moreover, microthemes with their descriptors should stand out, as in the typography of some school texts, where paragraphs have descriptors in the margin.

The *addition of elements* to improve document content representation might include a thesaurus (perhaps as a supplement to the general thesaurus of the journal), a list of suggested indexing terms, and a model of the discussion (Meulenberg, 1964).

In many cases, a clearer *description of intention* in the title, captions, abstract, extract, or digest is needed. Katter (1967) has studied the fidelity of these constituents by methods of pattern.

There is a need for *editorial checking* of the text, the descriptors of microthemes, and the abstract against a vocabulary of preferred terms. Edited author abstracts could then be more easily lifted by abstract journals. This vocabulary should show a moderate structure for unbiased guidance of the user.

the user and publishing producers

There are two kinds of producers of document content representation: publishing producers and non-publishing producers. Publishing producers can meet the users' needs only as far as their finances allow. They always publish for a sizable *group* of

users, and their frame of reference and vocabulary control are always much broader than those of the individual user. Their document content representation rarely reaches to the depth of microthemes. I have indicated some ways of improving the producers' approach for satisfying users' needs, such as the use of a vocabulary of preferred terms by the editors of specialized journals, the editorial control of author abstracts, and the refinement of document presentation. But these remain partial remedies.

A great saving of effort may be computer-controlled printing. The same tape could be used for both printing and document content representation (Kuney, 1968). Parts of the document suitable for document content representation could be selected for abstracting journals. This same material may also be used as input for information storage and retrieval systems.

the user and non-publishing producers

Among non-publishing producers, cataloguers and special librarians will go as far as finances allow in satisfying users' needs, generally much further than publishing producers: they respond to a restricted pattern of enquiries and approach the function of a literature searcher for a research team, so that the gap between user and producer virtually disappears.

Apart from these special library situations, non-publishing producers include the producers of information storage and retrieval systems, which offer real possibilities for satisfying the user insofar as the presentation and vocabulary of the original document are thoroughly checked. Information storage and retrieval systems with full tape (or other form of storage) coverage of special fields need be set up at only a few points in the world, where they would be staffed to provide the link between enquirers, including other information retrieval systems throughout the world, and the tapes. Future development includes the possible substitution of these systems for our current abstract journals (Davenport and Tate, 1968).

In these information storage and retrieval systems, document content representation may go down to the microtheme level, if the documents are published by new methods articulating the microthemes far more clearly and providing these microthemes with controlled key descriptors. This clear document structure, which should be made an obligatory condition for publishing for incorporation into information storage and retrieval systems, might be induced by instruction and education of authors. Together with mechanized storage and retrieval, this may enable real satisfaction of users' needs. It is conceivable that the leaders in the field, medical documentalists with MEDLARS and Excerpta Medica and chemical documentalists with Chemical Abstracts Services, may in due time be able to persuade authors and editors of the leading scientific journals along the directions suggested.

conclusions

There is a users' preference for methods of assignment, which opens the possibility of correlating the users' microvocabulary with the producers' macrovocabulary and eventually bridging, at least partially, the gap between the two. If, nevertheless, methods of derivation should be used, then a language with a low level of implications

is preferable. Clear presentation, including distinct microthemes and their descriptors, is important for both methods of document content representation.

Structure in vocabularies has a distinct function in helping the user in retrieval, but it must be kept simple; hierarchical structure may limit the number of approaches or the freedom of search strategy.

By using links between descriptors, the producer meets the need of the user for division of the document into microthemes. The eventual shift of responsibility for document content representation from publishing producers to non-publishing producers will favour the partitioning of complete documents into microthemes.

Author abstracts could be more acceptable if checked by the journal editor against a specialized vocabulary of preferred terms. Editorial offices of specialized journals could be ideal places for the maintenance of such thesauri.

More critical reviews are likely to be issued and should find a ready market as they are solving, by their selection, the users' problem of the vast quantities of literature.

Use of the same tapes for printing documents and for document content representation in both publishing and non-publishing production would lead to greater speed and accuracy in information storage and retrieval.

Future developments along these lines should help to reduce the gap between the users' and the producers' approaches to document content representation.

I hope that these points may give opportunities for a further exchange of ideas, here and now, or somewhere in the near future. I must confess that my difficulty in preparing this presentation has been that of keeping two balances: first, between the wish to cover as much ground as possible within a limited time and the necessity to confine this ground sufficiently for specificity, and second, to keep a balance between facts and wishful thinking.

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standardization in relation to medical librarianship: a survey

H. Oatfield

I am pleased to have this opportunity to greet you all here today, as well as honored to be asked to address you, but it is not without trepidation that I embark on a survey of standardization in relation to medical librarianship, for I recognize and acknowledge my limitations. Every day fresh facets evolve, so that the surveyor's task comes to resemble that of Sisyphus. Standardization is thrice traveled territory to some elements of this Congress You may have been repulsed by a stuffy abstract, but, behind the cliché and the *réchauffé* lies truth. It is a little like the case of the preacher whose son answered a parishioner in this way, 'Yes, ma'am, Mrs. Brown. My father does often give the same sermon. You don't recognize it, though, because he hollers in different places'. Perhaps I can hit a few different spots for my 'hollerin' today.

Co-operation between libraries has grown perceptibly on both the national and international scenes since 1950. Co-operation presupposes the existence of some common ground in practice, as well as a sharing in effort and resources. While responsive individuals, including medical librarians and information scientists, have pushed toward that goal, another strong impetus for standardization has come from developments in machine technology. The need to use computers in library operations has exerted pressure on these practitioners to hasten part of the evolutionary process leading to standards. The usual categorizations applied to standards are international, national, and proprietary. Performance standards will not lie within the scope of this discussion.

I hear the wheels whirring within male brains present that this matter of standardization must involve charts of standard height and weight for age to be applied to acquisition and processing librarians, coupled with the stipulation that all female personnel put in public areas, not just at circulation desks, shall conform fully to an ideal 5-foot-8, 110-pound, willowy form, and basic 36-24-36 or even more provocative curves; while the reference librarian's brain-cage capacity shall, according to the latest anthropomorphologic studies, lie within a seemly range. For those of you who think in terms of the metric system, that is 90-60-90; I was not referring to midgets. There are other no less important correlative criteria for males (Fisher, 1964). This is not the documentation I propose to discuss here today, formally.

Were we to consult any dictionary, we would uncover a battery of familiar definitions of the words 'standard' and 'standardization'. Yet two recently applied definitions not appearing in the lexicon enhance the picture. The first, offered by Jerrold Orne (1967), is for *standard*: 'scope, design and application of an object, a system, or device, based upon near-universal concurrence of producer and consumer bodies'. The second definition stems from an address by F. C. Ewert (1969): '*Standardization* is [an action] based on the premise that safety, interchangeability, economy, and efficiency can be promoted through drafting and promulgation of standards'. He continues, 'Quite often these standards are given little or no thought until the

need for them is urgent . . . at some point the lack of standards becomes burdensome, so standards emerge'. Any step which advances information exchange, the forerunner of understanding, among the peoples of mankind is commendable, provided its benefit comes at a reasonable cost and carries no penalties in the form of concomitant social losses. I shall mention a number of such advances which, while not specifically intended to benefit the operation of a medical library, will tend to have an impact upon medical librarianship. A stated objective of the MLA is 'improving the professional qualifications and status of medical librarians' (By-laws, Art. d, Section 2A). Out of the problems that inconsistency creates for the toiling librarian has come a drive to create uniformity wherever variety is not necessary to truth, creativity or independence.

standardizing agencies

Foremost among agencies which set standards affecting medical libraries are scientific societies, library associations, governments, and the standardization bodies. In the U.S.A. alone, there are more than 300 societies which develop standards. Naturally, not all standards developed* affect medical libraries directly, though many, like the 1967 revised standard nomenclature and definitions for illuminating engines or the standards for rubella vaccine, can have indirect bearing.

A number of these technical societies banded together 50 years ago under leadership from the U.S. National Bureau of Standards to create an American standardizing body which via several moultings has become the United States of America Standards Institute†. USASI is the American participating member of the International Organization for Standardization (ISO), a vehicle which the UN has supported to promote worldwide standards on commonly used materials, sizes, regulations, and procedures. Some 55 countries espouse the international activity, but only 23 are participating members at present in the work of its Technical Committee 46 (ISO/TC 46), concerned with library work and documentation. At this time, the other countries are observers and lend moral support. Interesting developments within standards bodies of the different nations come under general scrutiny. They are sometimes used as incentives if not models by the standards groups in other nations, and frequently are taken up directly by ISO/TC 46 working parties as well. One such product of the Indian Standards Institute has gained attention this year: a standard code for transport of live animals, which assures animals such as monkeys, livestock, laboratory subjects and so on proper hygiene, ventilation, temperature, light, food and water, and attention to any illness or injury during their journey whether by air, land, or sea.

While a survey is supposed to have historical roots, I do not build my base upon the standardization of the stylus for cuneiform writing nor the width of rollers for papyri in the great Bibliotheca of Alexandria. We know from observation, and Dr. Francis (1946) has told us, 'It took half a century or more for the first page of the printed book to develop into the normal title page consisting of title, author and

* In the field of engineering there are said to be 16,000 separate standards.

† On 1 October 1969 the phoenix rose from the ashes as American National Standards Institute (ANSI).

imprint, and there have been many changes of fashion in the ingredients of the title'. To me, modern standardization in librarianship begins with Panizzi as Keeper of Printed Books in the British Museum. Sir Anthony first standardized the call slip as a printed form. Before that, any scrap of paper sufficed. Then he devised rules for compilation of the catalog, and went on to greater things. Earlier, Leopardi, engaged in cataloging manuscripts in the Barberini Library in Rome, had written to his father, 'Librarians are as jealous and sordid as they are ignorant, and scarcely allow anyone to use their books' (Thomson, 1869). That attitude has gradually been eroded.

We shall now vault over almost a sesquicentennial of improvements in professional activity, behavior, organization, and equipment, and avoid involvement with the simultaneous evolution of technology. It was realized at the end of the Second World War that standardization on a global basis was badly needed, and that only through co-operation could it come about. FID and ISO pressed for active work on documentation standards both at national and international levels.

disciplinal activity

the medical library association

At that post-war time the MLA had long since set requirements for institutional membership, relating to size of collection (1,000 volumes; 25 periodical subscriptions), employment of a qualified librarian (but no qualifications specified), and official designation of the hours during which the library was open to its clientele. Thereafter, the qualifications of that librarian working those stated hours were spelled out in greater detail, with educational requirements indicated, though not made binding, and the curriculum defined and refined. Following the turn of the tide at Galveston in 1949, a program of certification evolved with a Committee on Standards to try to keep it contemporary. Minimum standards for the training of medical librarians have been achieved, published, and applied by the Association's Curriculum Committee. Approved courses for medical librarians have been established at 15 U.S. library schools. Refresher courses (even expander-of-horizon courses), which treat a variety of related fields, including aspects of machine technology, are offered by the Association at intervals. This is history. You may not know that, of the 1,500 individual members of the Association, scarcely 400 are certified. About 60% of the certified members fall into the class of charter certification. The passage of time has worked its usual attrition without much new blood in the way of certified replacements or any real incentive provided to cause either old or new members to strive for certification. In its current form the certification program recalls that old music hall ditty:

Why build a wall around the graveyard
When nobody wants to get in?
Why build a wall around the graveyard
When nobody wants to get out?

The Herner Company study (Weinstock *et al.*, 1966) on American medical library conditions prepared for the Office of Science and Technology provides a balanced review of present training of medical library personnel. It says in part 'At present the

[MLA certification] code is more useful in the abstract than as a working tool for personnel evaluation or hiring practice'. But, as Justice Cardozo (1928) emphasized, 'If the individual falls short of the standards of the group, he does so at his peril'.

An *ad hoc* committee of five was appointed in 1967 to develop a new certification code. To date, it has not been able to agree on its approach to these problems. The MLA Board also created another *ad hoc* committee on standards for the training of medical library technicians, about 5 years after Gertrude Annan's plea (1964) was made. In its first year it had not succeeded in making a definitive statement on what it is medical library technicians do. It has continued to struggle to make such a statement, so that eventually it could give attention to criteria for training them. Meanwhile, a pioneering course is readied at the State University of New York (Syracuse). These training programs and internships are little and late to yield enough qualified medical librarians and technicians, but better a half loaf.

Two generations ago Justice Cardozo (1921), speaking of the realm of law, wrote, 'We are tending more and more toward an appreciation of the truth that, after all, there are few rules; there are chiefly standards and degrees. . . . New times and new manners may call for new standards and new rules. . . . Few rules are so well established that they may not be called upon to justify their existence as means adapted to an end'.

The world of medical librarianship likewise is moving away from rigid rules and standards toward the flexibility of criteria and guidelines. Uniformity for its own sake is ridiculous. Individual situations call for different ways of handling procedures. Nevertheless, that bond that exists between medical librarians everywhere comes about in part because there are some common elements in the treatment of the day's work in each medical library. The *esprit de corps* also reflects commonality of education, standards, and service ideals. To be first class at this time, a medical library must be a health sciences library with selection of basic resources reaching across formal disciplines; a strictly medical collection no longer suffices. This condition holds true for libraries in any of the related paramedical fields, too. Nursing, hospital, dental, pharmacy, toxicological, medical, and research staffs, and social workers all require access to the material that goes to comprise a health sciences library.

In 1962, the MLA held a symposium on library standards. It was not a landmark, merely a record of the state of the art at that time. Some members have continued to express dissatisfaction that more concrete standards were not invoked by the various accreditation boards, committees, and associations. It calls to mind a delightful old *chastooshka*, or epigram, concerning our ubiquitous Russian friend, *staraya baba*. An old woman is going to Moscow happily talking to herself. As she walks on she grows tired and she blames Moscow for it. But Moscow doesn't know: *A Moskva ne znaet.*

Most of the accreditation boards have had broad statements concerning libraries and how they would be assessed in relation to the overall quality of service and education in the given institution. All the disciplines are more or less in agreement on the matter. These statements have five or six interchangeable parts. The statement of the American Council on Pharmaceutical Education, nebulous if you like, is typical: 'The library should be adequate to provide for the needs of the program of the college; it shall be in [the] charge of trained personnel. Evidence of use made of the library by

staff and students will be sought' (American Council on Pharmaceutical Education, 1966).

Formulating flexible guidelines that leave room for variety, ingenuity, and the exceptional circumstance perhaps has proved these regulating agencies wiser in the long run than their critics. At the 1962 symposium, Miss Marshall (1963) pointed out that standards are set for minimum proficiency even though voluntary, and that it is the effectiveness of the service given by the library staff that counts, not the extent of the holdings in the library. And Mrs. Robinson (discussion to Marshall, 1963) called attention to the neglect of physical facilities in the guidelines, an oversight since corrected.

Standards for evaluation of library services in depth have been well summed up by Sewell (1968). But he did not include among his provisos one which heads the list of the Dental Library Guidelines (American Dental Association, 1963): it asks, 'Is there sufficient budgetary provision for the purchase of new volumes requested by faculty and students?' Fiscal neglect causes rapid deterioration of any library.

Four professional medical societies in the U.S.A. have fostered a Joint Commission on Accreditation of Hospitals (Yast, 1967). This Commission has established and enforced standards for hospitals. The standards designate seven departments as essential to accreditation, with a medical library one of the seven. Along the way, hospital library standards were separately introduced on the scene. In 1967/68 the Association of Hospital and Institutional Libraries Division of the ALA started a move for their revision. Members of the MLA Hospital Library Section joined with representatives of other interested organizations to modernize these exemplars. A final draft revision referring to proposed standards for libraries in health care facilities has been submitted for approval to MLA, SLA, CLA, AHIL, AHA and CHA. The ratification process is incomplete. Its serious omissions dismayed the MLA Board (Felter, 1969). The revision makes a distinction for only two kinds of libraries: those for personnel and those for patients.

Separate nursing school libraries are fast disappearing, since either the libraries have been integrated or the nursing school library closed with the school. But nurses in these institutions have adequate access to library facilities, usually in the health science center's library. Parenthetically, it is the small library, the one- or two-man operation, that most needs guidelines to fall back upon.

The American Association of Colleges of Pharmacy has sponsored a Joint Committee on Pharmacy College Libraries, including representatives from the Pharmacy Section of MLA and from the Pharmaceutical Division of SLA. For nearly 20 years this Joint Committee has puttered at its problems without developing either standards or guidelines. To give credit due, however, it has produced some admirable checklists of periodicals and of standard reference works, which will someday comprise part of a handbook for pharmacy librarians. The real standards in this area are those set by the schools themselves through the American Council on Pharmaceutical Education.

Thus, it is evident that the MLA has been primarily concerned, first, with its own membership requirements, then education for medical librarianship, and also with an attempt to create an atmosphere of professional *esprit*. Robert Maynard Hutchins

(1969) draws a distinction between professional organizations as pressure groups and those that are true learned professions. The latter are organized to perform a public service and are based on an intellectual discipline. Medical librarianship involves the learning of several disciplines.

From the professional idea there arises 'the attempt to generate standards and judgment' (Hutchins, 1969). The MLA is testing its philosophy at this point today. Much of the value of the standards MLA attempted to set earlier has been vitiated by unforeseen turns of events, chiefly the continued shortage of suitable personnel, while libraries remain still handicapped by inadequate resources, so that low salaries prevail.

faseb

The Federation of American Societies for Experimental Biology (FASEB) has undertaken a project to develop *criteria* for quality control of input in science information systems. It is funded by the Council on Library Resources. Once the criteria have been recognized, they can be applied in labeling quality of input units, so that on retrieval high quality information can be distinguished readily from low, or even be separated via computer. It is anticipated that existing selection criteria of journal editors, publishers, librarians, and reviewers in the biomedical community may be pooled to help in the initial work of the project. FASEB also has sanctioned a project to draft guidelines for referees or reviewers of articles submitted to journals.

governmental activity

cosati

The U.S. Federal Council for Science and Technology's Committee on Scientific and Technical Information (COSATI) has a 'national schema' based on the concept that acquisitions, processing, depositing and archiving be done only once in the national system. Insofar as health science resources are concerned, it is the NLM that shall continue to bear that burden. COSATI regards the following areas as fitting for national standardization: data elements, format, systems policy, system description and communication codes; it avoids the fields of equipment, procedures, computer programming, and computer codes.

COSATI revised its *Standards for Descriptive Cataloging of Government Scientific and Technical Reports* (1966) to provide rules appropriate to the needs of information and documentation centers, and the reports departments of libraries, thereby gaining practical uniformity that permits relative interchangeability; libraries of government departments can use each others' report entries with minimal editorial revision. The rules govern the form of the essential elements in descriptive cataloging of reports from accession number to supplementary note and security classification. Subject and classification factors lie outside its scope. The format of the catalog card resulting from application of these rules is suggested, too. COSATI has also prepared a standard format for reports; essentially, this standardizes the title page of a report, though it does not neglect the body and reference material. It has other projects afoot among

its panels. You are reaping benefits from this activity in the section of the *NLM Current Catalog* devoted to reports having medical significance. USASI Z39's recently approved 'USA standard for a format for information interchange on magnetic tapes' (1969) is a refined version of MARC II. Its Appendix C is a specific implementation worked out by COSATI for utilization of the subrecord directory portion of that format for books, and Appendix D a similar adaptation for periodicals. The COSATI interdepartmental standardization of microfilm and microfiche requirements constitutes another tangible benefit. USASI PH5 is in process of revising its old standard for micromedia. It may set two standards, differing in the matter of resolution and starting point, to accommodate both government and industrial needs.

national library of medicine

It is axiomatic that anything which affects NLM affects medical libraries and librarianship. This domino theory of medical librarianship makes it clear that the *Anglo-American Cataloging Rules* affect medical librarianship, because NLM has adopted them as its authority in establishing personal and corporate authors in its *Current Catalog*, with only minor modifications; the stress must be placed on *current*. Cataloging of NLM older material has not been revised. Again, technical reports are cataloged by rules 'adapted from' the COSATI standard. Since January 1968, corresponding report citations have appeared in the *NLM Current Catalog*. NLM does not use the ALA *Filing Rules for Catalog Cards*.

A standard exerting a unifying influence on Spanish-using libraries in Latin America has recently appeared in the Rovira and Aguayo subject heading authority list (1967); its effect is comparable to that of the *Anglo-American Cataloging Rules* for English-using libraries.

food and drug administration

The Scientific Information Facility of FDA has devised a National Drug Code which enables it to organize and handle in a computerized data bank basic information pertaining to prescription and certain over-the-counter drugs. From this data bank will come a *National Drug Code Directory* (PHS, 1969). The Drug Code is a nine-digit number written for acceptability to computers in this fashion 123-4567-89 (that is, a 3-4-2 grouping). The first group of digits will identify the manufacturer, the second will specify the drug, and the last two numbers the type of package size. FDA's Scientific Information Facility will administer the code (Kissman, 1968) and assign the first three numbers identifying the labeler-manufacturer. Drug makers themselves will assign the remaining six digits, some of which may be letters. There is no check digit (Kissman, 1969)*. A list of the labeler code assignments is not ready for distribution, but will become available upon publication of a definitive *National Drug Code Directory* in the latter part of 1969. A prototype directory containing information on more than 4,000 products was produced by computer in April 1968, using a provisional code to test proposed procedures, and circulated to potential users to get their criticism.

* *Progress of the U.S. Government in Scientific and Technical Communications 1967*, belatedly issued by COSATI in 1969, describes a slightly different coding system and states that a check digit will be used. That is no longer the case.

An input form has been designed and coding instructions have been issued for recording the information to be submitted by manufacturers to the FDA Drug Data Bank on each of their products. For the purposes of the *National Drug Code Directory*, 'a product is defined as any article intended for the diagnosis, cure, mitigation, treatment, or prevention of disease in man' (Kissman, 1969). One of the first uses of this National Drug Code will be in connection with drug bill claims submitted for repayment under the Medicare-Medicaid and other health programs of the Social Security Administration.

Another likely application might be the compilation of a National Drug Compendium. It would offer authoritative statements on action, side effects, contra-indications, and other aspects of prescribing. As such, it would have a marked 'influence on patterns, customs, and conventions of medical practice' (HEW Task Force, 1969), and on that phase of medical library reference service. Drug programs of several other nations – notably the U.K., Australia, and New Zealand – provide all their physicians with prescribing guidelines prepared by panels of independent experts. Such publications, frequently updated to meet changing conditions, have been widely accepted by the medical professions in those countries. The question has been raised whether the U.S. situation necessitates something different in achieving the goal of rational prescribing.

The National Drug Code will prove to have many additional applications once it has become operable at full scale. It will not only benefit manufacturers and the government in their control and distribution operations, but hospitals, pharmacies, insurance companies, doctors, and poison control centers. Several forms of the *Directory* will be needed: an inverted listing in order to locate specific products by number, and classified arrangements by types of action come first to mind. These code numbers will soon appear in standard reference sources such as the *Merck Index*, the *Red Book*, the *Blue Book* and the *American Drug Index*. Eventually, the appearance of code numbers in these source books may obviate the need for printing future editions of the *Directory*, but probably not of a compendium. An AMA committee is currently engaged in producing a drug compendium also. Governments of other nations where drugs are made may see the obvious advantages of this arrangement and adopt similar drug coding practices in their domains later. No attempt has been made to work through WHO to develop a system of international drug coding practices. Some arrangement resorting to additional digits could do that job when the time does come.

other government agencies

The Federal Aviation Agency is responsible for setting medical standards for civilian aviation personnel. (No doubt the Dutch government regulates KLM similarly.)

The National Archives is proceeding with a program for indexing by computer archival documents and manuscripts. The finding aids already developed by various federal and state government agencies and some private institutions will be subjected to the same computer program for analysis. Generation by computer of finding aids for a given body of archival materials is also under trial.

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proprietary activity

Among proprietary standards of interest: The American Institute of Architects (1963*a*; *b*) has published its own *Standard Filing System for Product Literature* (it also appears as Chapter 4 in the Institute's *Handbook of Architectural Practice*). The Book Manufacturers Institute (1969) has published *Minimum Manufacturing Standards and Specifications for Textbooks.* The National Fire Protection Association (1969) has circulated for consideration a tentative standard: *Recommended Practice for Protection of Library Collections from Fire.*

national activity

usasi z39

ISO/TC 46 prodded USASI into creating a committee (Z39) to pursue standardization in library practice. ISO/TC 46 also asked for U.S. opinion on its own recommendations, but did not at first pause to hear the reply. Within Z39, a series of sub-committees set to work on topics from ISO's suggested list. In the first ten years of its existence, Z39 completed only four American standards. Gradually, momentum has mounted as funding from the NSF and the Council on Library Resources has been received, but the process is still painfully slow. As Markuson (1967) says, 'reasonably acceptable standards [have to] be developed within reasonable periods of time'. Approved American standards in this field now number seven, and concern: basic criteria for indexes; specifications for trade catalogs; periodicals: format and arrangement; compiling book statistics; compiling library statistics; periodical title abbreviations; and a format for bibliographic information interchange on magnetic tape. Standards nearing approval relate to: bibliographic reference; book advertising; standard book numbers; standard serial code numbers; transliteration of Russian; transliteration of other Slavic languages; romanization of Arabic; transliteration of Hebrew; romanization of Japanese; production of library directories; and specifications for the title page of a book. Other areas in which sub-committees are struggling to produce a satisfactory draft include: a filing or collating sequence; proof corrections; romanization of Chinese; transliteration of Yiddish; and abstracts. The proposed standards for abstracts developed by two successive sub-committees have failed to gain approval from the Committee as a whole. A third sub-committee is today busily engaged in recasting abstract criteria into a form that it hopes will avoid the criticisms leveled at previous drafts, 'while reflecting the best communication practices, not necessarily the most prevalent ones' (Weil, 1969).

Comments on a few of the existing American standards and their implications for medical librarianship are in order. *A Clearinghouse for Periodical Title Word Abbreviations* is in its third year of operation to provide approved abbreviations (based on the American standard*) for any word in any written language met in a periodical title. Because this Clearinghouse is a going enterprise, UNESCO has abandoned its plan to create such an agency in Europe. The Clearinghouse generates abbreviations for words by applying the principles of the standard. One of the

* ISO is also considering it as an international recommendation, and UNESCO has tentatively accepted it.

concomitant unifying elements is that abbreviated titles shall follow the same word order as is used on the serial itself. This rule is not intended to hamper or intimidate catalogers who indulge in corporate entry deviate practices. The standard is not a cataloging standard. It will be used by *Index Medicus*, *Biological Abstracts*, *Chemical Abstracts*, and most major secondary publications. Excerpta Medica has not announced its decison.

rabbits

In the words of Zeliatte Troy, late librarian of the Boyce Thompson Institute, 'Librarians are rabbits'. She was speaking of their courage not fecundity. Lo, librarians are as reluctant as any other component of society to relinquish one whit of individuality. The crux of the matter is this: a few idealists have seen the advantage of having standards and attempted to instigate actions that produce them. In desultory fumbling fashion, standards groups have gone their independent ways, until they bumped into the world of computers. That changed the compression ratio of their motivating drive. Even there, progress was hampered until general agreement could be reached on adoption of standards for media, *e.g.*, size of Hollerith punched cards, size of punches, and location of punch positions on cards making them readily machine-recognizable, and magnetic tape of specified width, thickness, and magnetic characteristics. According to Little and Mooers (1968), data encoding is the next stage of unification, yielding the standardization of computer language. The U.S.A. Standard Code for Information Interchange is under active user trial. A third area, in which computer users have yet to iron out their differences, involves the procedures for consulting a central computer, such as signals to gain access to the system, to delete, and to stop an operation. Shared time operations require this key.

After Mort Taube's pointer delivered (1964) at the Second International Congress on Medical Librarianship, much rethinking has been given to 'the total cataloging enterprise'. Traditional cataloging had been recognized to be too slow* to serve needs of scholarship, while existing information retrieval practices were inadequate for medical practitioners and research scientists. MEDLARS, BIOSIS, CBAC, and similar innovations were designed to correct that side of the complex. We have had the pioneering joint cataloging efforts of the medical libraries of Columbia, Yale, and Harvard. There is currently a co-ordinated automation effort of the three American national libraries to achieve compatibility and engage in a national union cataloging process; it may subsequently be combined with like ventures elsewhere. The pooling of British and American taped national compilations has already occurred in limited measure. This U.S. national data bank of machine-readable information has two major parts, catalog data for monographs, and location data for the several hundred thousands of serial titles held in American research libraries.

Without recapitulating MARC history (King *et al.*, 1963; Avram, 1968), it should be clear that this momentous enterprise has moved forward because of co-operation between dedicated, knowledgeable people who are not afraid to sail uncharted

* For a study showing how arrearages go merrily on, see Piternick (1969).

seas.* Early in the project it became apparent that many steps were involved, and also that a definite sequential order was required in carrying them out. A first essential was to identify the data elements used in bibliographic records. These many components have been organized with explanatory notes into a definitive report (Curran and Avram, 1967). Next came work on the format for bibliographic interchange on magnetic tape. It passed through several stages to reach its present form.

The modified MARC II format has been approved as a standard by three ALA divisions (Information Science and Automation, Resources and Technical Services, and Reference Service); it has also been adopted by the three national libraries in the U.S A. and it is now an American Standard of USASI. Beyond that, it has been adopted by a British National Bibliography project and perhaps elsewhere. As the *Annual Report* of the Council on Library Resources (1969) states· 'an international exchange of compatible tapes on a regular basis in the future seems to be assured'. The Library of Congress National Program for Acquisitions and Cataloging (of foreign material) through its regional offices makes use already of cataloging done in the countries of origin, and feeds it into the NUC gradually. Others envision that 'it should eventually become possible for all major publishing countries to pool their records in one flexible MARC system. The cataloging data required by new libraries and existing libraries could then be drawn from this international data bank' (Machine readable catalog, 1968). Such an approach to an international union catalog record reminds me of Hal Draper's (1963) classic 'catalog of catalogs of catalogs', called 'C^3', leading to the antepenultimate situation that 'although hardly anybody knew anything any more, everybody now knew how to find out anything'.

The basic MARC II format has five parts, of which no. 4, 'variable fixed fields', comprises the bibliographic portion of the record. It is truly remarkable in the variety of attributes that can be accommodated. It includes all the data given on the LC printed card and much more besides. As an example, in the section of the record called 'knowledge numbers', tags are provided for the BNB classification number, the DC number, the LC call number, copy statement, NAL and NLM call numbers, the NAL subject category number, the UDC number, and a local call number. Few libraries would include all of those codes, but if anyone so wishes, the provision has been made for them. What can be stored in the other four parts by judicious coding is equally extensive.

Additional groups have worked on related sections of the large picture. Thus, there needs must be codes for dates, places, languages, machine filing rules, standard book numbers, universal serial code numbers; in short, a whole cluster of interlocking standards to make a computerized union catalog venture work. The computer has become a great unifying force. It is as though by standardizing steps, the computer were moving medical librarianship from Whitehead's (1959) Stage of Romance to the Stage of Precision.

A standard system for numbering books of all publishers had been worked out in the U.K. Its value was immediately apparent. By co-operative efforts, the system

* One of the stanchest of these is Mrs. Henriette Avram. To her, nothing was fixed inevitably or by tradition, nor was change iconoclastic, nor any job hopeless because it was huge and had many ramifications. Her positive approach 'Let's see what we *can* do' has been invaluable.

has been expanded to include all books published in the English language, whether of Australian, Canadian, Dutch, American, or other origin; furthermore, through country and language code modifications, the books published in other languages anywhere in the world can be brought into it. An ISO subcommittee is engaged in resolving the details. It is this standard book number (SBN) which is being used for monographs in the NUC, beginning with works in the English language. It will be about four years before the program can be enlarged to include works written in other languages. The SBN, briefly, is always nine digits in length, but divided into three parts, *e.g.*, 0000-0000-0. When printed, each part is separated by a space or a hyphen. The first part identifies the publisher (publisher prefix), the second part identifies the title or edition if there is more than one (title number). Publisher prefix and title number together always total 8 digits, although the division between the two parts may vary. The third part of the SBN is one digit in length and is a check digit, whose function is to insure against error in manual transcription.

Development of a method for encoding distinctive universal serial numbers is not as far along. A subcommittee of USASI Z39 is working intensively on it in co-operation with members of the National Serials Data Program at the Library of Congress and a Task Force panel. They hope to have a proposed draft standard ready for consideration by June 1969. 'The National Serials Data Program is expected to lead to an exhaustive, continually updated central record of periodical publications and their library locations utilizing automated techniques' (Council on Library Resources, 1969). The need for a standard identification code of libraries applicable for machine readable records is making itself felt, too.

the reticular age

Pundits will soon speak in these terms. We hover on the verge of an age of networks but first must build appropriate consolidated information centers (Williams, 1969*) before we can connect these parts into a world information grid. Then compatibility problems will compel widespread adoption of communication standards. That part of them which has to do with tape transfer has begun.

A center which some of you may not have tuned in is the Pesticide Center at the NAL. It has developed a thesaurus, *Pesticide Vocabulary* (NAL, 1969), to standardize terminology in its field of endeavor, and carried it through several editions. The Center's two computerized systems, for herbicides and for pesticides, are now accepting demand searches outside the government. The pesticides tape has an input base from 1,100 journals or equivalent sources; that for herbicides is not so extensive; there is some overlap between the two.

international

unesco

On the international scene there are intertwined activities and some duplication of effort. That supragovernmental body, UNESCO, has supported four programs in documentation, the third of which is 'Establishment of Common Minimum Standards for the Use of Traditional and New Techniques and for Vocational Training Programs'

* 'The strength of the network depends on the strength of the outstanding collections that it links.'

(Sviridov, 1969). In the furtherance it has abetted non-governmental FID and IFLA, who prepared two publications, *International Standardization of Library and Documentation Techniques*, and *Minimum Standards for the Training of Library and Documentation Personnel*, and also the publications, *Abstracting Services in Science, Technology, Medicine, Agricultural, Social Sciences and Humanities* (FID) and *Handbook on Library Statistics* (IFLA).

fid

FID itself has nine major objectives, no. 5 of which is 'Classification research and standardization of classification terms'. An active Study Committee on Research Information (FID/RI) has a project it is developing in this field with ISO/TC 46. In the U.S.A. there is no need for that particular type of activity. The FID Theory of Machine Techniques Study Committee (FID/TM) has, however, attacked the 'problem of paperless communication and optimal information transfer in pictographic, written and spoken transmission' (Sviridov, 1969), while the Study Committee on Operational Machine Techniques (FID/OM) hopes to standardize information storage formats for mechanical retrieval on the basis of UDC. Secretary-General Sviridov has stressed the only too apparent need to standardize hardware/software requirements in order that compatibility can be achieved among the various information systems which it is hoped may soon comprise a worldwide network. We are already well aware of the MEDLARS regional centers now dispersed in various European countries as well as the U.S.A. The consortium of OECD European member countries interested in MEDLARS now feed back collectively about 50,000 indexed citations derived from their own national biomedical journal literatures. Negotiations are under way to have other search centers at the University of Sydney, in Japan, in Canada, and in South America. May I counsel you not to cavil too much if at first you do not get the desired data delivery from a Center? An old French proverb reveals that 'even the most beautiful girl in the world can give only what she has.'

iso

The latest recommendation deserves passing allusion. It is ISO/R 919-1969, *Guide for the Preparation of Classified Vocabularies (Example of Method)*.

interdisciplinary centers

A more significant new blend is in the process of achievement at the University of Georgia Computer Center in its Common Data Base Workshop. It receives cooperative support from the FDA, CAS, the Pharmaceutical Manufacturers Association, and the NLM. This Center owns an IBM *360/65* computer, and has available for searching the following taped data bases: MEDLARS, CBAC, *BA*, *CT*, BioResearch Index, Chemical Abstracts Condensates, and Common Data Base. Negotiations are in progress to include Excerpta Medica tapes in the overall resources when the latter become available*. The ultimate strategy of the Center is to write a single generalized search program to be used on the IBM 360/65. The several data

* These negotiations came to naught. Excerpta Medica has made its tapes available in the U.S.A. exclusively to the 3*I* data center for 1970.

bases will be translated to standard format through specially written programs, so that they can be searched by the generalized search program. When all this procedure is on-line, the Center will not lack for customers. It is clear that encoding is the major cost involved, not machine time. The Center may, like MEDLARS, run a coding school for customers.

The Swedish Research Council has sponsored (Tell, 1969) a comparable center where bibliographic reference source tapes from ISI's *Citation Index* and *Index Chemicus*, *CT*, Space Documentation Service (ESRO-NASA), the *Artikkel-Indeks* (Norway), and locally produced material are melded. That input is not, however, medical. A MEDLARS regional center at the Karolinska Institute serves that need. Comparable experimentation has been carried on by Datacentralen in Copenhagen. Doubtless, numerous important nuclei may be forming elsewhere without my being aware of their operational presence. Canadian information scientists seem anxious to create a battery of centers suited to that country's needs, but require government understanding, funding, and co-ordination policies for impetus. Their National Science Library has been operating an SDI service from *CT* and ISI tapes and could become the focal point for a national network of scientific and technical information.

Proposals of the European Economic Community's Aigrain Committee for a communications network between European research centers, creation of a European library of computer programs, and of a committee for standardization of software, telecommunications research, and many others are still to be implemented.

Time does not permit dilation about the NINDB Neurological Information Network, the NLM National Biomedical Communications Network, and attempts at the structuring of compatible registries of patients around the world to permit meaningful exchange of data therefrom on trials of new therapeutic procedures. There is the U.K. consortium, and at least two centers for physics information have been created. In fact, a whole issue of *Library Trends* (January 1969) was devoted to developments in national document and information service centers.

International co-operative discussions are in progress between CAS and the Internationale Dokumentationsgesellschaft für Chemie (IDC) aimed at standardizing methods of handling chemical structure representation in the CAS registry and in IDC's developing a computer-based information system that will permit direct exchange of data between the two systems (*Chem. Engng News*, 1969). Avenues of co-operation with chemical information groups in additional nations are also being explored, for example, the U.K. center at the University of Nottingham. A Royal Dutch center is being established; the Belgian Center for Scientific Documentation is functioning. It is too early in its life to discuss UNISIST.

where standards can be found

Each agency which generates a standard has the duty to make it known to its constituency and that part of the rest of the world to which it should be applicable. There is mouthing that information about standards is hard to find. This is buncombe, even though so eminent a work as the new 12th edition of the University of Chicago Press (1969) *Manual of Style* contains only one reference to standards, to the SBN.

Table I. *Standards sources.*

Standards developed for libraries supporting health science education

1. Joint Committee of the Association of American Medical Colleges and the Medical Library Association. Guidelines for medical school libraries. *J. med. Educ.*, 40/1, part 1, 1965.

2. Joint Committee on Standards for Hospital Libraries. *Hospital Libraries; Objectives and Standards.* Hospital Libraries Division, ALA, Chicago, 1953 The 1969 revision of these standards is entitled 'Standards for Libraries in Health Science Institutions'. Copies of this draft proposal may be obtained from the Executive Secretary, Association of Hospital and Institution Libraries Division, ALA, Chicago.

3. Library Association. *Hospital Libraries; Recommended Standards for Libraries in Hospitals.* London, 1965.

4. Library Buildings and Equipment Institute *Guideline for Library Planners* Proceedings, ed. by K. Downs and H. Rovelstad. ALA, 1960.

5. Library standards: a symposium. *Bull. med. Libr. Ass.*, 51, 69, 1963.
   a. M. L. Marshall, The Medical Library Association, p 69-71.
   b. M. W. Green, The American Council on Pharmaceutical Education, p. 72-5.
   c. W. G. Ball, The American Dental Association, p. 76-77.
   d. G. R. Leymaster, The American Medical Association, p. 78-80.
   e. K. B. Babcock, The Joint Commission on Accreditation of Hospitals, p. 81-3.
   f. E. M. Anderson, The National League for Nursing, p. 84-7.
   g. Discussion, p. 88-96.

6. National League for Nursing, Division of Nursing Education. *Guide for the development of libraries in schools of nursing*, 2d ed. National League for Nursing, New York, 1964.

7. Special Libraries Association. Professional Standards Committee. Objectives and standards for special libraries. *Spec. Libr.*, 55, 672, 1964.

8. National League for Nursing Department of Diploma and Associate Degree Programs.
   a. *Criteria for the Evaluation of Educational Programs in Nursing Leading to a Diploma.* New York, 1962.
   b. *Criteria for the Evaluation of Educational Programs in Nursing Leading to an Associate Degree.* New York, 1962.
   c. *Toward Excellence in Nursing Education. A Guide for Diploma School Improvement.* New York, 1964.

9. National League for Nursing. Department of Baccalaureate and Higher Degree Programs. *Criteria for the Appraisal of Baccalaureate and Higher Degree Programs in Nursing.* New York, 1967.

10. American Council on Pharmaceutical Education. *Accreditation Manual*, 6th ed. Chicago, 1966.

Information about standards

1. Struglia, E. J. (1965), *Standards and Specifications Information Sources; a Guide to Literature and to Public and Private Agencies Concerned with Technological Uniformities.* Gale Research, Detroit, 1965. (Management Information Guide 6)

2. *Federal Information Processing Standards Register* (FIPS Pubs). Office of Technical Information and Publications, National Bureau of Standards, Washington. Official source of information in the U.S. federal government for hardware standards, software standards, application standards, and data standards.

3. U.S.A. Standards Institute. *1968 Catalog of U.S.A. Standards.* USASI, New York, 1968. Index and international recommendations (ISO) included. Lists U.S.A. standards current as of 31 December 1968. (At that date there were but 4 existing Z39 standards concerning library work and documentation and 18 ISO recommendations.) Published every other year; next revision will appear in 1970. In addition to Z39, other USASI committees concerned with aspects of documentation include:

PH5	Photographic reproduction
X2	Office furniture and equipment
X3	Computers and information processing
X4	Office machines and supplies
Y1	Abbreviations of documents
Y10	Letter symbols
Z85	Library equipment

4. National Clearinghouse for Periodical Title Word Abbreviations. c/o Chemical Abstracts Service, University Post Office, Columbus, Ohio 43210.

News and notes concerning American standards

1. *Magazine of Standards.* USASI, 10 E. 40th St., New York, N.Y. 10016.
2. *News about Z39.* Z39 Office, Wilson Library, University of North Carolina, Chapel Hill, N. Car. 27514.

3. *ACM Standards Newsletter.* Publishes reports on activities of USASI Committees X2, X3 and Z38. Association of Computing Machinery, 4064 Solano Drive, Palo Alto, Calif. 94306.

The MLA publishes in its *Bulletin* and its *Newsletter* reports, revisions, and news items concerning its standards and standardizing activity. The National Bureau of Standards maintains a Federal Information Processing Standards Register. It provides information on standards for hardware, software, applications, and data in the U.S. federal government. USASI (1969) biennially publishes a *Catalog of American Standards* produced under its aegis. Printed and microform copies of the individual standards, and of entire classes of standards, are offered for sale (and *we hope* application). It also published lists of ISO recommendations in detail, and gives publicity to selected standards of other nations in its *Magazine of Standards.*

The ISO Secretariat has moved recently from The Netherlands to the German Federal Republic. The old order changed, owing to deaths and retirements. The standards institutions of each sovereign nation do their best to dispense information on their own standards. Abstract journals, notably *Information Science Abstracts*, *BA*, and *CA*, also give attention to the subject.

Struglia (1965) undertook to make a guide to this kind of literature in the U.S.A. The resulting volume, *Standards and Specifications Information Sources*, published in 1965, is the best available single source known to me. Inevitably, works of this nature become dated, though like an almanac never completely out of season. You probably

have noted the convenient compilation of standards made by Swets and Zeitlinger*, and seen their historic specimens.

Both national (USASI) and international (ISO) standards are reviewed at 5-year intervals, and either reaffirmed or revised; adherence to their recommendations is always voluntary.

developments desired

As I have grown grizzled and grumpy, some of my biblio-info-retrieval desiderata have been satisfied, but new lacunae keep opening up. Among possible remedies are the following.

standard retention and discard criteria for books and serials

These are needed for various categories of working library collections principally, not the great repositories. The medical library community is more favorably situated in this respect than its peers, because it is aware that most of the informational quasi-knowledge it handles has a definite half-life, even though it does not arrive with a scheduled date of discard attached. At what level of non-use may items properly be dropped, stored, or sent to a depository? What shall be selected for historical collections, what sold to dealers or offered on exchange, or pointed to with pride as unalloyed Garrison-Morton treasure and the wherewithal of antiquarian catalogs?

standard identification codes for libraries and book dealers

The NUC symbols for library identification are not suitable for use in machine systems, hence the need to provide a code for machine-readable records that will indicate locations. As local and state systems begin to merge into national and international pools, the problem will expand acutely. Several proposals involve use of telephone area code numbers as part of a structured number for this purpose. It is important to stress that we need symbols capable of identifying medical libraries wherever they may exist in the world. To a lesser extent there is need to identify booksellers in comparable manner.

national and international catalogs of monographs in special fields

By particular application of the MARC format, the Library of Congress has prepared, for its own reference service use alone, special catalogs based on its Science-Technology Divison holdings. Drawing upon the increased data base of the burgeoning NUC, new special catalogs of this kind would prove to have wide utility in medical libraries. The NLM has already added material from Countway and the State University of New York (Syracuse) to its *Current Catalog*. By the same technique, it could draw on other important libraries with medical resources, no matter where they may be located, to expand the record. That increased data base might then be recast within specialties, just as the fresh MEDLARS taped journal data form the output for 15 continuing bibliographies of current literature. The Library of Congress is developing strategies for retrospective subject cataloging; in the medical field, such action would be of lesser import.

* Distributed at the Congress.

directories of men of science

A few countries have published directories of their medical specialists and scientists or issued Who's Who in Science, but almost without exception these compilations list only the senior elite members. It would be a distinct boon to have a comprehensive volume for each country, which would complete those rosters in uniform style by including the young men from the time they enter practice or obtain their first professional posts. In this connection, standard guidelines for the contents of such directories might also be useful.

standard nomenclature of veterinary diseases and operations

This HEW classification has been well worked out and carried through one revision in 1966 by the Epizootiology Section of the National Cancer Institute in collaboration with the staffs of the Colleges of Veterinary Medicine at Michigan State University and the University of California, Davis, and members of the veterinary profession. But no provision for keeping it current has been made. Supplementation in the fields of parasitology and tropical diseases is sought, as well as for newer virus disorders. Representatives of HEW, WHO, FAO, the Veterinary Bureau of FDA, and the American Veterinary Medical Association are interested, but no one has seized the initiative so far. The good beginning should not be allowed to lapse into obsolescence. WHO has recently established a Veterinary Nomenclature Committee in its Division of Communicable Diseases. Perhaps it will take on this chore and make the standard nomenclature worldwide in scope on a continuing basis.

standard classification for viruses

You are aware that IUBEN has adopted an excellent numeric system for identifying all existing enzymes, so that there can be no question concerning the one meant. It is being used widely by editors of journals and scientists reporting their studies. The scheme has allowed ample room for new discoveries to be accomodated. Virology has not yet reached a comparable stage of understanding, permitting clear-cut taxonomic classification; nevertheless, the level of knowledge is such that it might be reduced to a practical order permitting application of a specific numeric code of identification.

standard copyright law to safeguard the working copy

A legal base is necessary which, first, will not only protect the individual's right to, but encourage the preparation and distribution of, working copy reproductions of printed matter for members of the physical and biomedical science community; which, second, does not impair or interfere with computer manipulation of data input from copyrighted sources or its recapitulation; and which, third, will not prevent telefacsimile transmission of copy.

standards for symbol representation

Freeman (1967) has mentioned 'problems resulting from unsystematic advances in hardware aggravated by lack of standards for encoding symbols, both literal characters of text and signals and function codes that identify certain documentary and typographic characteristics'. Neither the MARC II format nor the U.S.A. Standard

Code for Information Interchange resolve this issue. It is the character set problem amplified. We need a set of conventions to convert text to machine-readable form. Several tentative systems are being tried, but unless uniform criteria are adopted, conversions from one machine to another are going to stay badly snarled. It is one reason so much programmer time is wasted at present in rewriting.

conclusion

Enlightened rabbits already prefer standard terminology, recognizable reference citations, consistent cataloging practices, uniform indexing, modular files, quality binding, ready identification and location characteristics, perhaps even equatable statistics. Now they are learning to love computers for their help in tapping remote resources rapidly, in compilation and comparison of data, for quick printing, and in consolidating control over worldwide biblio-output.

The remnants of rabbit fear and dislike will drop away as familiarity increases, at least with the mechanism of machine-executed bibliographic information interchange, if not through actual manipulative participation Dean James (1969) exhorted fledgling doctors to 'let our next generation remember you at least partially for your contribution to the improvement of quality and not alone for merely organizing or distributing the contributions of your predecessors'. Can we afford to do less?

A medical library as an administrative organism comprises systems and records. Standardization can be applied to either, just as it is possible to automate one or the other or both. In the effort, some individuality may be lost for the greater gain in ease of operation. Standardization efforts have a tendency to go unheralded and unsung. The USASI Z39 Committee has suffered for years from a lack of adequate publicity. Collison (1967) opines that 'the able and unobtrusive work done by the British Standards Institution in the field of documentation is not as well known as it deserves to be', and my parapsychological sense tells me this condition is repeated elsewhere in the world. Motivation for change comes with general social awakening, heightened awareness. You can help shape the future of medical librarianship by continuing to indicate activities you consider deserve attention or modification. In the field of medical librarianship we have the same proportion of aristocrats by virtue of their creative power as in any other field. What new tools should be invented? Have we outmoded pursuits which should be dropped altogether? Keep alert to possibilities for standardization. It is no longer socially acceptable for you to continue as passive rabbits. If, like *staraya baba*, you grouse only in private, Moscow is not going to know it should provide bus service. Most actions are taken only after a demand has been expressed. Once an idea has been voiced, persons of like or of contrary mind will speak out. Then the reality of the need becomes apparent to all. Those perennial gorgons of the medical library, shortages of space, staff, and funds, cannot be exorcised by creation of standards. But adoption of standard practice wherever possible in medical librarianship will tend to reduce the level of frustration, friction, and waste motion.

I have tried to indicate to you what a few people as individuals have accomplished, what a few more banded together into groups of increasing size and complexity —

societies, associations, governmental bodies, national committees, international unions — have painstakingly and painfully slowly brought about, and how the pace of standardization is quickening today. From time to time I ask myself whether I really believe in standardization. My conclusion so far is always the same: for nomenclature and methodology, yes; for people and education, no. From the time of Confucius the importance of clear language has been stressed. We still fight the battle of the thesaurus in every area of learning. Now the insensate computer has confounded us with its requirements. Our previous bouts of concern with inconsistency begin to seem petty. Regional TWX wire service has taught us to standardize our way of presenting questions and requests for help or interlibrary loans. If we are to communicate between data centers, we must extend this passion for unification, yielding up our minor differences for the general good. Not only will we have standardization of approaches to the practice of medical librarianship, we shall also maintain self-imposed high standards of service. Charles Evans Hughes (1925) pronounced in a historic dental examiner decision 'What is generally called the "ethics" of the profession is but the consensus of expert opinion as to the necessity of standards.'

In conclusion, I borrow a thought from the great poet Neruda (1967): 'If you give something to humanity, you get something more wonderful back'. We medical librarians first and foremost give service, and our evolving standards for medical librarianship are helping to keep high the quality of that service rendered humanity.

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VI

medical subject headings for small medical libraries

Irwin H. Pizer

The problem of subject headings in libraries has a long and glorious histo which has been recounted in many places many times. For all of the many discussio however, the problem seems no closer to resolution today than it has been in the pa In fact, it may be a problem for which there is no definite solution at all. What different today is that there are compelling reasons for libraries drawing together order to use the resources of other libraries effectively as they become more and mo accessible to smaller and smaller libraries.

language barrier

One of the most important problems concerning the adoption of any set subject headings as an international standard is that of translation. It is obvious th to be truly international a standard must be polyglot and that a list such as MeSH therefore most useful in a library which uses English as its primary language.

Because it is unfortunately true that the translation of MeSH into other languag is not a simple task, there have only been preliminary attempts to perform this wor Some work has been done in translation into Spanish, investigation into the proble of translation into French, and some pages have been experimentally translated in Japanese. The difficulties which beset this task are the same as those which hinder ar translation activity, primarily, that the list is not convertible on a word-for-word basi Although there are sections of terms which are, in effect, already international, suc as anatomical terms, and other commonly used medical terms for syndromes and th like, the fact remains that there are many terms which identify concepts, such a 'mother-child relations', 'group practice', 'organizational affiliation', etc., which ar not easily definable and which may tend to be nonsense if translated on a word-fo word basis. I am reminded of the comments of an *Index Medicus* senior indexer an reviser who constantly was forced to correct one indexer's translation of *krankenaut* from 'sick car', to 'ambulance'. A further discussion of some of these problems can b found in the booklet *Excerpta Medica Automated Storage and Retrieval Program o Biomedical Information* (Excerpta Medica, 1969*a*).

It must be noted that the language problem is not as acute in the development o a standard format for the exchange of machine-readable information, for example because it is only physical relationship of pieces of information which is dealt with i that case and not the meaning of the information itself. Because of this, then, th discussion which follows about the use of medical subject headings in small medica libraries must, of necessity, have an Anglo-American bias and provincialism, fo which I apologize.

the problem

Why are subject headings a problem for the small library at all? The very size of a library's collection is probably the major reason. Let us assume that a library of 5,000 to 10,000 volumes is to be organized and that these volumes are divided into two-thirds journals and one-third monographs. Assuming that the journals are not classified, this gives us a collection of 3,334 monograph volumes at the most, with probably fewer titles due to multiple volume works. In order to provide a key to these titles we must now face the task of assigning the subject headings and classification numbers. The chances are that by the time a book is selected and acquired in a smaller library the cataloging information has already appeared in a source such as the NLM *Current Catalog*, even though there may be a lag of several months by the time issues are received in European libraries. The librarian, therefore, has the choice of accepting cataloging as prepared in a very large medical library or of performing the subject analysis work anew. Which choice should be made, and why, are not easy questions to answer. Let us first examine some of the reasons why a small library should perform its own subject cataloging.

1. By performing its own subject cataloging a library can more accurately emphasize the particular interests of its users.
2. Given the small number of titles in the collection, the use of very specific headings, such as those preferred by the NLM, tends to spread the catalog out and may result in a large number of subject headings with only one or two titles assigned to them.
3. If a small library wishes to follow NLM practice and use subject guide cards instead of typing the heading at the top of the card, an unnecessarily bulky file is created.
4. A small library may have untrained personnel who are not capable of assigning technical terms or analyzing technical monographs The use of a more general subject heading list, therefore, makes it possible for untrained staff members to cope with a technical subject.
5. It may be faster to perform the cataloging afresh than to wait for a published source.
6. The library's collection may be so specialized that a more detailed subject classification is required than a list such as MeSH provides.
7. So much of the library's material may be in an area that NLM regards as peripheral that the cataloging cannot be obtained from its published sources.
8. The library may not be able to afford the purchase of such tools as the *Current Catalog* or sections of the Library of Congress proof sheets.

On the other hand, there are many reasons why the small library should not perform its own subject cataloging, some of which are merely inversions of the preceding arguments.

1. It will cost the library less to use the cataloging of another library without c g it.
2. It avoids the need for a trained cataloger or subject expert for book a

3. It allows a library with limited staff to devote more time and effort to the informa tion needs of the users.
4. It enables libraries to exchange data more readily if a standard entry is adopte
5. It converts a professional task into a subprofessional or clerical one.
6. It is most economical of human resources as well as financial resources.
7. It may be faster to copy the cataloging from a published source than to perfor it afresh.
8. It simplifies the user's task in finding information by providing a unified vocabular which is the same for books and journals. In addition, it enables him to use man other libraries without having to translate his terminology into another set of term

Taking as an axiom that the most important function of the library is to provid the user with the information he requires, it follows that anything which the librar does which facilitates this process is to be held desirable and *vice versa.*

Since it is indisputable that *Index Medicus* is the major current informatio dissemination tool in a medical library of any size, we find ourselves with a comple list of medical subject headings with which both user and librarian must cope on daily basis. If we recall that the division between journal literature and monographi literature is 2 to 1, as mentioned above, then it is clear that we must consider MeSH the *Index Medicus* subject heading list, as the major, modern, medical thesaurus If we accept it in its role in relation to the journal literature, is it not schizophrenic t reject it out of hand for monographs? When we likewise consider that MeSH *is* use for cataloging the monographic literature by the NLM and this cataloging is publishe in inexpensive form and is available with reasonable speed, it would appear eve more irrational to maintain an independent subject heading list for monographs.

It becomes necessary, therefore, to determine whether the arguments for o against independent cataloging by a small library can be satisfied by using MeSH either as it appears in *Index Medicus* or in the condensed and perhaps more general form in NLM's subsidiary publications including the pilot issues of the projected *Abridged Index Medicus* (NLM, 1970).

Perhaps the most telling argument against the use of MeSH in the small library is that it gives too much detail and may be likened to the use of a sledgehammer to drive a pin into a peanut. Whereas this argument is in the main true, it *is* possible for a smaller library to elect to use the more general terms instead. Although this means that a small library would have to reassign many headings if they used NLM-prepared cataloging, this task is simplified through the use of the MeSH categorized lists to move up the tree structure to the more general term required; the advantage here being that at least a term will be used which is compatible with those used in libraries using MeSH. Indeed there may be an added advantage here in that an additional access point is provided for the less highly technical user who may not be aware of all of the specific terms relating to a subject in which he is interested. This would help, for example, the doctor or research worker seeking information outside his own special area of competence, or nursing or paramedical personnel. If MeSH is made accessible at the catalog, however, the user is aided in finding related terms outside of his area of expertise also by consulting the categorized lists.

Table I.

	MesH	INI	IDL	AIM	CC	HLSH	NSH
Inexpensive	+	+	+	+	+	+	+
Kept current	+	+	+	+	+	?	?
Scope broad enough	?	+	+	+	?	?	?
Scope deep enough	—	+	+	—	—	?	?
Suits special needs	?	+	+	?	?	?	?
Too specific for small collections	+	—	—	—	?	—	—
Spreads catalog unnecessarily	+	—	—	—	?	—	—
Allows for addition of special features	+	+	+	+	+	?	?
Permits use of prepared cataloging	+	+	+	+	+	—	—
Requires trained professional for use	?	?	?	?	?	?	?
Enables user to work in many libraries	+	+	+	+	+	—	—
Facilitates interlibrary data exchange	+	+	+	+	+	—	—

MeSH – Medical Subject Headings *(Index Medicus)*
INI – *International Nursing Index*
IDL – *Index to Dental Literature*
AIM – *Abridged Index Medicus* (Specimen fascicle, v. 1, no. 1, January 1968)
CC – *Current Catalog*
HLSH – Hospital Literature Subject Headings
NSH – Nursing Subject Headings (CINL)
+ = yes — = no ? = perhaps

inexpensive

In order to be of the greatest use to the greatest number of libraries, it is important that the price of the subject heading list be kept within the budgetary limitations of the smallest institution. Priced at $2.00 per year for the subject heading list alone, MeSH certainly cannot be called expensive, or as our English colleagues might say, its price is 'not immoderate'.

kept current

In a field which is changing as rapidly as medicine, both in its scientific advances and in the conception of its role in society, it is especially important that a subject heading list also be responsive to these changes if it is to be an effective tool in maintaining the bibliographic control of the literature. That MeSH is a vital and changing tool is only too well known to those of us who are faced with making the annual changes in our catalogs necessitated by the addition of new headings, deletion of old ones, and subdivision of complex topics. Yet, were these changes not to occur, then the effectiveness of the list would be impaired and ultimately destroyed. With this annual updating may be contrasted the nine-year period which elapsed between the

sixth and seventh editions of the Library of Congress *List of Subject Headings*. It is also interesting to note that the ALA's *Guide to Reference Books* did not substitute the term 'library science' for the, by now quaint, term 'library economy' until 1967, and that under the radical new heading they still omit the mention of the NLM's Medical Subject Headings. This, even though the first supplement (1968) claims to cover no more than material published through 1966, is still a glaring omission.

scope broad enough

One problem that some libraries have found in the use of the *Current Catalog* is that it is not representative of their collection. This has tended to be true of those libraries which relate to educational institutions and where there is a heavy emphasis on research which takes the user's interest into the basic sciences and away from clinical medicine. In order to compensate for this narrow interpretation of the scope of medicine, the NLM has been engaged in a co-operative cataloging program with two academic libraries since June 1968. These libraries are the Francis A. Countway Library of Medicine at Harvard and the State University of New York Upstate Medical Center Library in Syracuse. The addition of entries for items cataloged in those libraries has already broadened the scope of the *Current Catalog* and, it is hoped, made it more useful to other libraries. The subject areas which these libraries have added to the file of data are nursing, the medical support professions, or health-related professions, as they are now commonly being called in the U.S.A., behavioral sciences, such as psychology, sociology, etc., dentistry, medical education, and so forth (Onsi, 1970).

Many libraries, including those mentioned, must go beyond MeSH for non-medical terms, and in such cases another standard subject heading list such as that of the Library of Congress is to be preferred over *ad hoc* terms developed by the staff of the library.

scope deep enough

This problem has already been alluded to and is one which is not easily solved. It is obvious that if a library is devoted to a very specific subject area, then no subject heading list is going to be adequate for much of its material. In such a case, it would seem advisable to generate a list of subject headings which cover the specific field and then to use MeSH for other materials when possible.

suits special needs

One cannot argue that MeSH is all things to all people, nor could it be and remain a tool of workable size. It seems likely that special subjects will need to continue to develop their own thesauri, although the principles of construction can be the same as those used for MeSH. That such developments are feasible is exemplified by the work now in progress at the Parkinson's Disease Information Center at Columbia University. Here a highly specialized subject area is being indexed with an augmented thesaurus which is being 'mapped' to relate it to the existing MeSH terminology. An

ABRIDGED INDEX MEDICUS

HISTORY OF MEDICINE.

surgery of internal organs Matsumoto T et al Arch Surg (Chicago) 94 861 4 Jun 67

HEMOSTASIS

Laboratory tests of hemostasis The relation to hemorrhage in liver disease Spector I et al Arch Intern Med (Chicago) 119 577 82 Jun 67
An experimental study of venous hemostasis Harris BH et al Surgery 61 891 5 Jun 67

HEMOSTATICS

Cyanoacrylate adhesive and hemostasis Matsumoto T et al Arch Surg (Chicago) 94 858 60 Jun 67
The use of a hemostatic agent as a definitive dressing in the management of the donor sites in partial thickness skin grafting Hagstrom WJ Jr et al Plast Reconstr Surg 39 628 32 Jun 67

HEPARIN

Hyperlipemia in acute pancreatitis Metabolic studies in a patient and demonstration of abnormal lipoprotein triglyceride complexes resistant to the action of lipoprotein lipase Kessler JI et l Amer J Med 42 968 76 Jun 67
Inhibition of renin by heparin Sealey JE et al J Clin Endocr 27 699 705 May 67
Studies on the anticoagulant action of heparin protamine and Polybrene in the activation of factor IX Shanberge JN et al J Lab Clin Med 69 927 37 Jun 67
Modification of tumor microcirculation as an adjunct to hyperbaric oxygen in radiotherapy Evans JC et al Radiology 89 140 3 Jul 67

HEPATIC ARTERY

Aneurysm of the hepatic artery An unusual cause of obstructive jaundice McEwan Alvarado G et al Amer J Dig Dis 12 509 14 May 67

HEPATIC COMA

Acute hepatic coma treated by cross-circulation or exchange transfusion Burnell JM et al New Eng J Med 276 935 43 27 Apr 67

HEPATIC DUCT

Secretion of bile in response to food with and without bile in the intestine Nahrwold DL et al Gastroenterology 53 11 7 Jul 67

HEPATITIS

Antibodies to cytoplasmic antigens in primary biliary cirrhosis and chronic active hepatitis Paronetto F et al J Lab Clin Med 69 979 88 Jun 67
Localized radiation hepatitis as demonstrated by scintillation scanning Concannon JP et al Radiology 89 136 9 Jul 67

HEPATITIS, INFECTIOUS

Raw shellfish and infectious hepatitis Canad Med Ass J 96 1481 2 3 Jun 67
Abnormalities of serum monoamine oxidase in chronic liver disease McEwen CM Jr et al J Lab Clin Med 70 36 47 Jul 67
LSD mainlining A new hazard to health Materson BJ et al JAMA 200 1126 7 19 Jun 67
Cytomegalovirus hepatitis in the adult Toghill PJ et al Lancet 1 1351 4 24 Jun 67

HEPATITIS VIRUSES

Cytomegalovirus hepatitis in the adult Toghill PJ et al Lancet 1 1351 4 24 Jun 67

HEPATOLENTICULAR DEGENERATION

Ceruloplasmin in Wilson s disease Holtzman NA et al J Clin Invest 46 993-1002 Jun 67

HEPATOMA

Familial cirrhosis with hepatoma Mille MC Amer J Dig Dis 12 533 8 Jun 67
Electron microscopy of some human hepatomas Ruebner BH et al Gastroenterology 53 18 30 Jul 67

HERBICIDES

Pesticide transformation to aniline and azo compounds in soil Bartha R et al Science 156 1617 8 23 Jun 67

HERMAPHRODITISM

Hernia uteri inguinalis in a male Binns JH et al Brit J Surg 54 571 5 Jun 67

HERNIA

Gastric herniation as a complication of transverse colostomy Figiel LS et al Radiology 88 995-6 May 67

HERPES SIMPLEX

Correlation of B virus and herpes simplex virus antibodies in human sera Cabasso VJ et al J Lab Clin Med 70 170 8 Jul 67
Recurrent herpes in the rabbit and man Kaufman HE et al Science 156 1628 9 23 Jun 67

HERPES ZOSTER, OCULAR

Azauridine in viral eye infections Mysha V et al Lancet 1 1230-1 3 Jun 67

HERPESVIRUS

Isolation of a virus from Burkitt lymphoma cells Mitchell JR et al Lancet 1 1354 9 24 Jun 67

HERPESVIRUS HOMINIS

A serologic study of herpesvirus hominis strains by microneutralization tests Pauls FP et al J Immun 98 941 7 May 67
Recurrent herpes in the rabbit and man Kaufman HE et al Science 156 1628 9 23 Jun 67

HERPESVIRUS INFECTIONS

Herpes simplex encephalitis two fatal cases Hader W et al Canad Med Ass J 96 1565-70 17 Jun 67
Adoptive immunity to intracellular infection Frenkel JK J Immun 98 1309 19 Jun 67
Correlation of B virus and herpes simplex virus antibodies in human sera Cabasso VJ et al J Lab Clin Med 70 170 8 Jul 67

HEXOSAMINES

Occurrence of 3 amino 3 6 dideoxyhexoses in Salmonella and related bacteria Luderitz O et al J Bact 93 1681 7 May 67

HEXOSEDIPHOSPHATASE

Genetic mapping of mutations affecting phosphoglucose isomerase and fructose diphosphatase in Escherichia coli Fraenkel DG J Bact 93 1582 7 May 67

HEXOSES

Studies in vivo and in vitro of glucose stimulated insulin release The effects of metabolizable sugars tolbutamide and 2 deoxyglucose Kilo C et al Diabetes 16 377 85 Jun 67

HICCUP

An effective method for the treatment of hiccups during anesthesia Salem MR Anesthesiology 28 463-4 Mar Apr 67

HIP

The shape of vertebral bodies and femoral necks in relation to activity Houston CS et al Radiology 89 59 66 Jul 67

HIP JOINT

Austin Moore prosthesis Comparison of results in the treatment of fractured femoral neck and arthritis of the hip Berkin CR et al Brit J Surg 54 645-9 Jul 67
Successful amputation through the hip for pseudotumour in severe haemophilia Fessey BM et al Brit J Surg 54 569 71 Jun 67
Idiopathic osteoarthritis of the hip Comparison of the results of treatment by Austin Moore prosthesis and mold arthroplasty McDonough JM et al J Bone Joint Surg (Amer) 49 625 31 Jun 67
Iliopsoas bursal extension of arthritic disease of the hip Melamed A et al Radiology 89 54 8 Jul 67

HIRSUTISM

Testosterone and androstenedione blood production rates in normal women and women with idiopathic hirsutism or polycystic ovaries Bardin CW et al J Clin Invest 46 891 902 May 67

HISTAMINE

Effect of local gastric trauma on gastric response to histamine stimulation Milton GW et al Amer J Dig Dis 12 456 64 May 67
Determination of the dose of histamine causing maximal gastric acid secretion in the pylorus-ligated rat Thompson JH et al Amer J Dig Dis 12 449 55 May 67
Studies on the mechanism of nidation XXV A receptor theory for induction of decidualization Marcus GJ et al Endocrinology 80 1032 7 Jun 67
Maximal acid response to histamine in duodenal ulcer patients subjected to resection of the antrum and duodenal bulb followed by vagotomy Broome A et al Gastroenterology 52 952 8 Jun 67
Studies of the carcinoid syndrome its relationship to serotonin bradykinin and histamine Gardner B et al Surgery 61 846 52 Jun 67

HISTAMINE LIBERATION

Studies on the mechanism of nidation XX Relation of histamine release to estrogen action in the progestational rat Marcus GJ et al Endocrinology 80 1028 31 Jun 67

HISTIDINE

Formation and operation of the histidine degrading pathway in Pseudomonas aeruginosa Lessie TG et al J Bact 93 1800-10 Jun 67
Catalysis of ester hydrolysis by mixed micelles containing N-alpha myristoyl-L-histidine Ochoa Solano A et al Science 156 1243-4 2 Jun 67

HISTONES

An immunologic precipitin system between soluble *nucleoprotein and serum antibody in systemic lupus* erythematosus Tan EM J Clin Invest 46 735-45 May 67
Rabbit antibodies induced by calf thymus histone serum albumin complexes Sandberg AL et al J Immun 98 1182 9 Jun 67

HISTOPLASMOSIS

The ecology of histoplasmosis Addington WW Amer J Med Sci 253 687 96 Jun 67
Anti DNA in the sera of patients with uveitis Burns RM et al Arch Ophthal (Chicago) 77 777 8 Jun 67
Endvenectomy and decompression in fibrosing mediastinitis causing obstruction of the superior vena cava Fadhli HA J Thorac Cardiov Surg 53 881 5 Jun 67
Histoplasma ulcer of the tongue Hiley P et al JAMA 200 1130-1 19 Jun 67

HISTORY OF MEDICINE

Artificial insufficiency of heart valves (Rosenbach 1878) Rosenbach OI Jarcho S Amer J Cardiol 19 850-3 Jun 67
Facts legends and myths about the scalp throughout history Giacometti L Arch Derm (Chicago) 95 629-31 Jun 67
Some Canadian contributions to medicine Gibson WC JAMA 200 860 4 5 Jun 67
Portrait of Harvey as a young man (Harvey W) JAMA 200 982 3 12 Jun 67

HISTORY OF MEDICINE ANCIENT

Facts legends and myths about the scalp throughout history Giacometti L Arch Derm (Chicago) 95 629-31 Jun 67

HISTORY OF MEDICINE, 16TH CENT.

William Harvey and the circulation (Harvey W) King LS JAMA 200 981 3 12 Jun 67
Portrait of Harvey as a young man (Harvey W) JAMA 200 982-3 12 Jun 67

HISTORY OF MEDICINE 17TH CENT.

Why Galen and Harvey did not compare the heart to a pump (Galen) (Harvey W) Siegel RE Amer J Cardiol 20 117 21 Jul 67
William Harvey and the circulation (Harvey W) King LS JAMA 200 981 3 12 Jun 67
Portrait of Harvey as a young man (Harvey W) JAMA 200 982 3 12 Jun 67

HISTORY OF MEDICINE 19TH CENT.

Artificial insufficiency of heart valves (Rosenbach 1878) (Rosenbach OI Jarcho S Amer J Cardiol 19 850-3 Jun 67
Lister s contributions to microbiology (Lister J) Miles A Brit J Surg 54 Suppl 415-8 1967
At the bedside Talbott JH New Eng J Med 277 109-14 20 Jun 67

HISTORY OF MEDICINE MEDIEVAL

Facts, legends and myths about the scalp throughout history Giacometti L Arch Derm (Chicago) 95 629-31 Jun 67

Fig. 1. Abridged Index Medicus.

example of such 'mapping' may be seen in any of the annual issues of MeSH where the new or deleted terms are related to those which have been replaced or superseded, or where a general term has been subdivided to make it more specific. This may require a number of new terms being added to the list.

too specific for small collections and spreads catalog unnecessarily

This is probably the most cogent argument against the use of MeSH in small libraries, since it is unlikely that their limited collections will have a great deal of material on any one specific topic, and it may, indeed, be a disservice to the user to scatter the small amount of material available under many topics. In addition, if the library attempts to follow the practice of filing subject heading cards behind subject guide cards — as some American libraries are now doing — one must introduce many guide cards behind which there is only one entry. The results of this practice can be foreseen by examining the issues of the *Abridged Index Medicus* (Fig. 1). It is true that it would be easier to scan for topics if some of the single entries under very specific topics were moved to a more general heading. On the example shown here, one notes that **History of Medicine** is split into 6 headings. The 6 headings contain a total of 14 entries for 8 different articles. In addition, one is made painfully aware of the problems of indexing consistency. There are 3 articles about William Harvey: 2 appear under both **History of Medicine 16th Cent** and **History of Medicine 17th Cent,** but one article about Harvey appears only under **History of Medicine 17th Cent** and is also about Galen; however, there is no entry under **History of Medicine, Ancient.** One of the articles about Harvey also is entered under the general heading **History of Medicine.**

allows for addition of special features

An important requirement of any thesaurus is that it maintain a degree of flexibility which makes it responsive to the needs of the user, whether the user is considered as a reader or as a librarian. To illustrate the fact that MeSH is, indeed, able to be modified when the need is expressed, one can examine the pages of the *International Nursing Index* (Fig. 2). Here one can see that while it looks exactly the same as the other publications produced through the MEDLARS program, it is, in fact, different. One feature here, which is not found in the other publications, is the use of geographic subject headings. Here, on one page alone, may be seen 7 geographic headings, of which there are 2 types, countries, and for the U.S.A., states. The *INI* also makes use of a limited number of corporate subject headings for such bodies as the AMA, American Dental Association, and American Nurses' Association. These terms were added to MeSH in 1966.

health visitor Lord WJ
J Coll Gen Pract 10 247 56, Nov 65
Nurse physician communications in the hospital Christman LP JAMA 194 539-44 1 Nov 65
A coordinated consultation program for nurses and psychiatrists Holstein S, et al
JAMA 194 491-3 1 Nov 65
Survey shows importance of team care Gurdjian ES et al Mod Hosp 106 90-1 Jan 66
Patient-care roles discussed at physician-nurse national meeting Lambertsen EC
Mod Hosp 105 148, Nov 65
Patient service will improve if nurse-doctor communications do. Lambertsen EC.
Mod Hosp 105 108 Dec 65
Nurse-doctor relationships Peplau HE
Nurs Forum 5 60-75 1966
Role strains and adaptation in a multidisciplinary group teaching unit Schoenberg B et al
Nurs Forum 4 84 100 1965
An aspect of the work of the psychiatric team Davies HL, et al Nurs Mirror 121 v vi 29 Oct 65
Interview interaction behavior of supervisors, head nurses and staff nurses. Wiens AN, et al
Nurs Res 14 322 8 Fall 65
A staff nurse proposes Storlie F
Nurs Sci 3 386 8, Oct 65
Hospital relations. Robins BE
Radiography 31 167 71 Aug 65
[Do you use your representative—or why not?] Olsen O T Sygepl 65 388-9 Sep 65 (Dan)
[Separation or symbiosis, the responsibility of the nurse in relation to the life task of the physician] Fockert JA T Ziekenverpl 19 45-52 15 Jan 66 (Dut)
[Nurses mind your affairs] Oosterhuis R, et al T Ziekenverpl 18 774-5 1 Nov 65 (Dut)
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OCCURRENCE

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Fig. 2. International Nursing Index.

permits use of prepared cataloging

Perhaps the most important reason for the use of MeSH in a small library is the fact that it reduces the cost of processing new materials because one is able to use cataloging which has been prepared in another library. The cost of original cataloging in a small library is hard to justify, and that cost must not only include the actual time spent in redoing the cataloging and classification work, but should also be considered in terms of the time which is thus made unavailable for direct work with the user. This is especially important in a 'one man' library. The use of prepared cataloging reduces the processing of new items from a major intellectual task to a clerical one which a well-trained assistant or volunteer worker should be able to perform with little or no supervision. It must be said here that the only way to realize the economies of using another library's cataloging is to use that cataloging without making changes in it. If the staff of the small library begins modifying subject headings assigned to a book or altering the descriptive cataloging to simplify it, the savings are lost.

requires trained professional for use

Staffing is a major problem in any library in this period of extreme manpower shortages, and this problem is often aggravated in a small library due to the fact that it is small and that the institution may not be able to compete for staff due to salary scales. It is, therefore, extremely important that such a library obtain the best value for its budgetary dollar. Cataloging is a complicated professional task at best and consumes both time and intellectual capacity. Any subject heading list must be applied with care and consistency, and also with an understanding of the meaning of the terms in the list. MeSH, being a very specific list, must be applied with care, and many of its headings are not open to interpretation. Unfortunately, the NLM has not yet been able to make its dictionary of definitions of MeSH terms generally available, and the cataloger is left to determine the meaning of the heading from an examination of the types of entries to which it has been applied. This is time consuming at best and inefficient. It is to be hoped that the definitions will be available at an early date to help solve this problem. The *INI*, on the other hand, recognizing this problem and having access to the NLM files, has issued its own thesaurus which gives many of the MeSH definitions (Int. Nursing Index, 1969). This list was published as part 2 of volume 4, number 1, of the *INI*, approximately one year ago, and forms an extremely useful adjunct to that *Index* (Fig. 3). The ambiguity of such terms as 'ventilation', for example, is cleared up by the list of definitions. It does not, as might be suspected, refer to the exchange of air in the lungs, but rather to the process of supplying fresh air in a room. Because of these difficulties of interpretation, in addition to the problems of basic analysis of the content of book materials, the task of subject cataloging is clearly a professional one. It is unlikely, however, that the use of one specific list of headings or another will prove much less complicated than the use of MeSH.

NURSING THESAURUS

Functions, Standards, and Qualifications
(ANA's description of nurses' responsibilities in specific situations, i e., job descriptions and standards of qualifications and conditions of employment)
see Hospital Nursing Service; Hospital Personnel Administration, Nursing; Personnel Management; Quality of Nursing Care*; and specific fields of nursing, e g. Public Health Nursing

Future Nurses Clubs (Recruitment)
see Nursing, subheading "manpower", Students, Nursing

General Duty Nurses and Nursing
see Hospital Nursing Staff*; Hospital Nursing Service

GENETICS, HUMAN

GERIATRICS
(A medical specialty and geriatric diseases in general)
see also
Aged
Aging
Chronic Disease
Geriatric Nursing
Health Insurance for Aged, Title 18
Long Term Care*

Fig. 3.

enables user to work in many libraries

The use of a different subject heading list in the smaller library places an unfortunate burden upon the library's user, since he must be flexible enough to keep reformulating his information needs to conform with the idiosyncrasies of the many libraries which he consults in the course of his professional career. If this were merely a case of learning one system every few years and then working with it regularly, it would not be a great hardship. However, we must consider the fact that today's practitioner of medicine is a highly mobile individual, probably using many libraries in various hospitals and schools. It is no argument to say that he now has to reformulate his question to search *Biological Abstracts*, *Chemical Abstracts*, *Excerpta Medica*, etc., because it seems pointless to further complicate an already unsatisfactory situation. The magnitude of the problem has been recognized by Excerpta Medica (1969*b*) which has published a *Guide* to try to help the user through the maze of sections and the complexities of its internal classification system.

facilitates interlibrary data exchange

Just as libraries have finite amounts of money to spend in any given period of time, so does our society. It is unrealistic to assume that libraries can go on endlessly proliferating, storing more and more material for longer and longer periods of time, and still expect funding to be forthcoming. The adoption of a standard of any kind means that compromises will have to be made, and it is likely that not only will some

groups be dissatisfied with the standard, but rather that all groups will be dissatisfied to a greater or lesser degree. In such a case it must be the smaller institution which is willing to bend to the larger, for the needs of the larger being greater must necessarily encompass the needs of the smaller. The compensation which the smaller partner receives in such a relationship assumes the form of being able to take more than it gives. The adoption of MeSH as a standard subject heading list in a small library, even with the disadvantages thus engendered, makes it possible for groups of libraries to band together, not only for the exchange of information, but also to co-ordinate the process of acquiring and storing that information. Looked at in this way, the benefits to the small library are very great indeed. If one considers that within relatively small geographic areas there are many small libraries, let us say in hospitals, providing the same materials for their staff users, then it is possible to conceive of a truly effective co-ordinated acquisition program, either based on the subjects of specialization of the different institutions, or upon some artificial division which the libraries themselves determine. Through the use of a standard list of subject headings, then, the libraries are easily able to prepare multiple card sets for each of the institutions and maintain, in effect, a union catalog, since the cards from each library are interfileable. For such a co-operative system to be effective from the user's point of view, however, an additional step needs to be taken, and that is the provision of rapid messenger service between the participating libraries. Even with the expense of an added person for this service, it is reasonable to assume that the savings in avoiding duplicate acquisition of material, cataloging, processing, and shelving larger numbers of volumes than are absolutely necessary will be more than sufficient to offset the added salary. A cost element that libraries tend to forget is that of keeping a book on a shelf, for the cost of a book does not end when it has been cataloged and shelved the first time, but continues as long as a book is kept by the library, whether it is circulated or not.

In discussing medical subject headings today, it is especially important to take note of the rapid changes occurring in medical libraries due to computers and the electronic transmission of information over large distances. These developments have been discussed by various speakers, but Dr. Leiter's description of MEDLARS (this volume, page 155) must be of most concern to us in relation to subject headings.

The emergence of a plan for a U.S. nationwide system, the NLM Biomedical Communications Network, and an operating regional system, the State University of New York Biomedical Communication Network, illustrates clearly the need for a common language in exchange of bibliographic information and in the method of searching the data stored in the system (Pizer, 1969). As an example, it became apparent very quickly that if the participating libraries in the New York Network were to build a union catalog of monographic literature holdings and query the system by subject, then the same terms, used in the same way, would have to be employed. To do this, MeSH was accepted as the standard. In addition to MeSH, however, the thesaurus was augmented in many specific subject areas to increase the depth of specificity and also to allow for the use of commonly used synonyms and misspellings in querying the system. The selection of MeSH as the standard also allowed for all NLM book records from 1966 onward to be added to the union catalog thus created (Cain, 1969).

As one develops a machine system, a standard list of subject headings, descriptors, or thesaural terms must be developed in order to provide search capability of the files. The list must be determined at an early point in the system design, because various elements of the processing of the information depend upon it, such as determination of record format, size of data field to be considered, whether fixed or variable fields must be used, etc. (Bridegam and Meyerhoff, 1970).

The significance of these developments for small libraries is considerable, because ultimate plans call for regional, national, and international networks to interlock in exchanging and retrieving bibliographic information. On the regional level, it is expected that communication devices will be available in hospitals, neighborhood medical centers, or private group practice centers. The librarian has a real responsibility in determining the success of these efforts, not the least important area being that of subject headings. If we expect a user to follow one set of subject headings and rules when using the card catalog, another when using *Index Medicus* and other printed indexing services, and still another in searching a machine system, we have placed a burden on his shoulders, the weight of which will defeat our purposes and his needs (McCarn, 1969).

In a time of shrinking distances due to the advances in technology and the capabilities which technology gives us for transmitting not only bibliographic data, but entire documents, and regenerating them on paper at the receiving station, the need for standardization is global. Neither the small library nor the society it serves can afford to regard itself as too insignificant to be affected by these changes. The small library is a vital part of the information distribution network and is, in many cases, the most efficient, if not the only mechanism for communicating with a large part of the medical profession. The change over to a standard set of subject headings is a task which, although tedious and difficult, must be faced if the small library is to play its role in today's and tomorrow's provision of medical information to a user population which is as yet only half aware of the vast range of services which the small library can offer.

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standardization of serial title abbreviations

K. I. Porter

I propose in this paper to discuss the current situation in the international standardization of serial title abbreviations, at least insofar as the U.S.A. and the U.K. are concerned. May I apologize in advance to any who may be disappointed that I am not going to include any historical notes on the development of this particular feature of documentation, nor any justification of their use in documentation at all; I shall assume that their utility is generally accepted.

A common Anglo-American standard is soon to appear, promulgated in the U.S.A. by the United States of America Standards Institute (USASI), and in the U.K. by the British Standards Institution (BSI); there have been indications that the provisions of these standards — I must speak of them in the plural, since internationally agreed standards must be adopted by national standardization organizations to have validity for the country concerned — will have a wider acceptance internationally. The immediate background to the development of this new, common standard is that the existing U.S. standard in the field, Z39.5-1963, *American Standard for Periodical Title Abbreviations*, fell due for re-confirmation or revision in 1968. Although the equivalent British standard BS 4148:1967, *Recommendations for the Abbreviation of Titles of Periodicals*, had been published in the previous year, BSI took the occasion to approach USASI with a view to bringing future versions of the two countries' standards on periodical title abbreviations into closer accord. The two groups concerned in implementing this project were the Subcommittee on Periodical Title Abbreviations of USASI's Committee Z39 on Standardization in the Field of Library Work, Documentation, and Related Publishing Practices, and the Subcommittee on Abbreviations and Codes in Documentation of BSI's Documentation Standards Committee OC/20. A close working relationship was established between the chairmen of these two subcommittees, respectively Mr. James L. Wood, Head Librarian of the Chemical Abstracts Service, and myself, Editor of a publication whose current title in full (and I apologize for its length) is the *British Union-Catalogue of Periodicals incorporating World List of Scientific Periodicals: New Periodical Titles (BUCOP)*. Both chairmen are thus closely concerned with periodical title abbreviations as part of their normal work, as well as in their association with their respective national standardization organizations.

As you can imagine, the work of bringing the two standards into accord has involved a considerable amount of transatlantic correspondence, with the frequent exchange of drafts and comments on drafts. Mr. Wood and I also had two very fruitful meetings in the course of 1968, one in Columbus, Ohio, and the other in London. For a time it looked as if our two groups had reached the ultimate degree of accord possible, which was rather less than 100%, but I am glad to be able to tell you now that later developments have led to virtually complete agreement. There will be certain minor variations between the two standards in the wording, from such considerations as the British use of the phrase 'full stop' for the American 'period', and

so on. I should perhaps point out that both standards will retain the word 'periodical' in their titles when they appear in the revised form, but they are intended to apply to the more comprehensive term 'serial'.

The work of reconciliation and co-ordination of the two national standards concentrated, in the first instance, on the production of a common set of principles; at a later stage, work was also undertaken on the production of a list of common abbreviations for individual words. There was, in fact, a considerable degree of agreement between the respective national word-abbreviation lists, and the problem reduced itself to one of rationalizing existing differences in the treatment of certain words. This again involved the exchange of proposals and counterproposals between the two countries to iron out such problems as the British use of *Br.* for 'British' whereas the Americans used this abbreviation for 'Branch', and *Brit.* for 'British'. This has now been resolved, both groups agreeing on *Br.* for 'British' and *Bra.* for 'Branch'. A potential problem area here which resolved itself by agreement on the basic principle was the matter of compound words, on which I shall have more to say later. I shall now outline for you the main features of the forthcoming common standard with regard to the principles of periodical title abbreviation.

The first point I would make in this connection is one that is not specifically stated in the standards, but is implicit: that accurate reconstruction of the original title from the abbreviation is not an aim. The British standard BS *4148:1967* included provisions which were intended to facilitate this object, but these complications appeared to cause more editorial trouble than they were worth. Naturally, the revised standards increase the risk of the same abbreviation being used for different titles, but provision is made for distinguishing these in a suitable and informative manner. The object is simply to produce a unique abbreviation for a particular periodical title, in the most mechanical manner possible, so that, in fact, a computer could at need be programmed to handle the matter, at least to produce the 'basic' abbreviation. To any organization that regrets the fact that the form of abbreviation recommended in the revised standards does not ensure reconstruction of the original title without reference to some sort of master list, I would say that, for their purposes, they should not abbreviate at all.

Both standards will state that 'they are not intended to serve as a guide for establishing form of catalogue entry', but on the other hand, that the principles outlined 'may be applied if required to corporate author entries'. These statements touch on a matter which is a cause of some disquiet to me personally, speaking from the point of view of documentation; however, some concession to the idea of corporate authorship appeared to be necessary because of the provisions in this connection of the *Anglo-American Cataloguing Rules* of 1967, emanating from the 'Statement of Principles' arrived at by the International Conference on Cataloguing Principles held in Paris in 1961. There are differences in detail between the 'British Text' and the 'North American Text' of these rules, but both agree in recommending entry of serial publications in a catalogue under a corporate author, if the name of the body under whose authority the serial is published is contained or implied in the title itself, whatever form it may take there. This principle of entry has not been followed in the current *BUCOP*, nor was it followed in the old *World List of Scientific Periodicals* in

its four independent editions. Entry under published title is the rule in these publications (but not, I should point out, in the original four volumes and supplement of *BUCOP*), although the current *BUCOP* does go further than the old *WLSP* in that it includes an 'Index of Sponsoring Bodies', referring from what in most cases could be called the corporate author, a phrase that I have avoided using in the current *BUCOP*, to the actual title. I do not propose here to go into the merits of title entry as against corporate author entry; I imagine I would only be preaching to the converted, since, as it appears to me, the scientific community in general and the medical world in particular plainly favour title entry. Of course, there are problems sometimes in establishing a title, especially where the component parts of what should be a title, incorporating the name of the sponsoring body, are separated on a title page or its equivalent; the *BUCOP* solution to this is to construct a title in what seems to be the form germane to the language concerned: for English, for example (and even more generally for the Romance languages), the form assumed is: title word or phrase, subordinate body, parent body. For a language such as Hungarian, the normal form of an integrated title would be exactly the reverse, and, where necessary, titles are constructed in *BUCOP* on this pattern for this language. These details have nothing to do with the abbreviation of serial titles directly; I mention them to bring to your attention the fact that organizations producing abbreviations based on the forthcoming Anglo-American standards according to different principles of catalogue entry can produce different abbreviations for the same title, even though each title *word* abbreviation is the same in both cases. For example, the *Journal of the American Medical Association* could be abbreviated as either *J. Am. Med. Ass.* or *Am. Med. Ass., J.* You will observe that there is an important stylistic difference represented by the comma in the second abbreviation, which I shall mention again later. From what I have told you of *BUCOP*'s practice, you will be in no doubt as to which of these forms I favour; I regret that what I conceive to be aberrations in certain current cataloguing codes obliged us to provide for alternative forms of abbreviation of the title as a whole.

Before leaving this particular topic, I should mention another implication for serial title abbreviations of the provisions of the '*Anglo-American Cataloguing Rules*': both texts agree that even where a corporate author entry is used, the 'true' title must be given in full if the name of the body contained in it is in a different form from that in which it would normally appear as a heading; even (according to the North American Text) if 'the remainder of the title is in an inflected form'. Thus, the corporate author form of entry is going to involve the organizations following this approach in some very lengthy and unwieldy abbreviations, which may, I hope, help to impress them with the absurdity of this particular approach to serial entry.

Whatever form of entry may be used as the basis of the title abbreviation, both standards in their revised form will say that 'the order of word abbreviations shall follow without omission the order of the words as they appear in the title entry chosen, except [that] long titles and long corporate names may be shortened provided that the title remains identifiable and its position in a comprehensive alphabetical list is not altered thereby'. The problem here is not one of a form of entry so much as a difficulty inflicted on the documentalist by the publisher himself, who may attempt to make the title describe overprecisely the nature of its contents, or to pay due

deference to a plurality of sponsoring bodies involved in a particular publication; in an example of the latter case, I assure you that *BUCOP* intends no slight to one Bernadino Rivadavia nor to a certain institute in recommending the abbreviation *Comun. Mus. Argent. Cienc. Natur., Parasitol.* for a serial whose full title is *Comunicaciones del Museo Argentino de Ciencias Naturales 'Bernadino Rivadavia' e Instituto Nacional de Investigación de las Ciencias Naturales: Parasitologia.* And how, I wonder, would an organization following the principle of corporate author entry cope with providing an abbreviation for this title?

The new standards continue the practice of predecessors in omitting subtitles completely from the application of the principles of abbreviation, despite the fact that, especially where a 'distinctive' single word is chosen as the main title, it is the subtitle that may be the more informative. The case is somewhat different with the 'secondary' title; this is a term devised to describe a title given to a section or supplement or subseries of a main title. In many cases this may be simply a generic term such as 'Supplement', but it could also be more descriptive, and yet there could be good reasons why it should not be used independently as the main title of the publication concerned. In these cases, it is a necessary addition to the abbreviation for the main title, also, of course, in abbreviated form. However, this secondary title may be omitted if it is numbered or lettered as a section of the main title, and in such a case even the generic word, such as 'Part', 'Section', 'Series', etc., may be omitted. For example, *Journal of Polymer Science, Part A-1: Polymer Chemistry*, may be abbreviated as *J. Polym. Sci., A-1.*

Individual words in a title which are omitted from abbreviations are all articles, and prepositions and conjunctions except where they begin a title. This is and has been normal with most systems of abbreviation, but the earlier British standard did allow the retention of a preposition and/or conjunction 'for the sake of intelligibility or as a shorter and surer means than addition of place of publication to distinguish ... titles which otherwise would have the same abbreviation'. This is no longer allowed in the revised standards. On the other hand, a conjunction may be retained in a different and 'neutral' form in the abbreviation, 'when the inclusion of an ampersand (&) for 'and' or its equivalent in any language could add clarity to the title abbreviation'. My own practice as far as *BUCOP* is concerned is to use the ampersand for 'and', etc., in every case, though disregarding it in filing, as to my mind it always adds clarity to the abbreviation. As it happens, it can also distinguish abbreviations in cases such as *Journal of Mathematics and Physics* and *Journal of Mathematical Physics*, abbreviated as *J. Math. & Phys.* and *J. Math. Phys.*, respectively.

I turn now to the matter of the abbreviation of individual serial title words. The recommended method of forming abbreviations is by truncation, *i.e.*, 'to drop a continuous group (at least two) of the final letters of the word'. The standards aim at discouraging the method of abbreviation by contraction, *i.e.*, by omitting internal letters. This latter method is not excluded entirely, but is restricted to words 'cited in the Word-Abbreviation List', and will be kept to a strict and adequately justified minimum. It is unlikely that many new abbreviations will be formed by this method; as you will realize, a computer can be programmed to make abbreviations by the truncation method. Words abbreviated by contraction would need to be retained in

the computer's memory, so there is an obvious advantage in keeping their number limited and preferably fixed. The standards forbid the abbreviation of words comprising a single syllable or of five or less letters, again, in the latter case, with certain exceptions as justified in the case of frequently used generic terms; these, too, have to be specified in the Word-Abbreviation List. Reference to this list is also required for another strictly limited category, as far as the abbreviation itself is concerned: those few words for which a single initial letter abbreviation is permitted.

The standards state the two related principles that 'the same abbreviation is not to be used for unrelated words', and 'different abbreviations are not permitted for the same word'. Thus, according to the first of these principles, related words, whether in the same language or in different languages, may be abbreviated in the same way, provided they differ only in their endings. Hence, 'Engineer' and 'Engineering' are both abbreviated as *Eng.*; 'Archiv', 'Archives', 'Archivios', etc., are all abbreviated as *Arch.* Naturally, this is likely to cause difficulty in trying to trace the full original title in a list filed according to strict alphabetical principles, especially in cases like 'Boletim' and 'Boletin', both abbreviated as *Bol.* Because of this, and because the information brought by users to a catalogue or union list to locate an entry is so often inaccurate, sometimes in comparatively minor details, *BUCOP* in its current form uses a filing order for the full title that disregards all articles, as well as prepositions and conjunctions (except where they begin a title), and interfiles cognate forms such as the '*Arch.*' family. In short, the *BUCOP* filing order has been strongly influenced, though not controlled, by the form of title abbreviations, and my feeling is (I admit I lack supporting evidence provided by any survey) that this facilitates rather than hinders location of a title in its filing sequence.

New abbreviations are made as required more or less on an *ad hoc* basis; the aim generally is to arrive at the shortest form which would be reasonably informative and unlikely to be confused with unrelated words. There are certain cases, however, in which a practice has evolved on the American side, and is to be adopted by the British, where consistency has been favoured over brevity. This is in the matter of related forms of word ending, *e.g.*, '-ology', '-ologie', '-ologia', etc., all abbreviated to *-ol.*, and '-ography', '-ographie', '-ografia', etc., all abbreviated to *-ogr.* The result has been to extend some of the existing British abbreviated forms, from *Ent.* to *Entomol.* for 'Entomology', for example, but the practice certainly simplifies the task of assigning abbreviations to new titles, as it reduces the number of times the Word-Abbreviation List needs to be consulted.

There was a deviation for a time between the British and American draft revisions of their standards in the matter of compound words. It was originally the British view that each element of a compound word could be abbreviated, if those elements were also wholly or substantially words in their own right, and an abbreviated form was given for these words in the Word-Abbreviation List. The abbreviated form was to indicate in some way that the original form was a compound word. For example, 'Wirtschaftsforschung' could be abbreviated as *Wirt.forsch.* The American preference, on the other hand, is to abbreviate the final element only of a compound word, unless it is hyphenated; in this case each element affected is abbreviated, retaining the hyphen, *e.g.*, 'Nauchno-Issledovatel'skij' abbreviated as *Nauch.-Issled.* The arguments

advanced in favour of the American practice are that it is not always possible for a non-linguist to determine the break point between the elements of a compound word, especially those appearing in less widely known languages, and there appear to be considerable difficulties in programming a computer to generate abbreviations formed according to the 'British' method. Impressed by these arguments, and by the strong preference for the American method expressed by the Abstracting Board of ICSU, the British sub-committee decided to adopt the principle as given in the American draft.

Other points of interest concerning the abbreviation of serial title words concern personal names, and groups of initials. Both standards require that a personal name in a title should not be abbreviated, and must be included in full in the title abbreviation: the use of the family name alone with a generic term does not suffice. As for groups of initials, representing the name of an organization, which form part of a serial title, both standards require that they be retained intact in the abbreviation, and always be capitalized throughout. *BUCOP* treats these forms as words in their own right, whether they form a vocable or not (*cf.* BSI as opposed to forms like USASI).

It is clear that, if serial title abbreviations are assigned on the basis of the principles that I have been outlining to you, there will be cases where the same abbreviation can occur for different serials, even if their original titles are different, albeit etymologically related. The revised standards make provision for these contingencies, as did their predecessors, by recommending certain forms of added identifier. The standards go further in recommending such additions to 'clarify short and potentially ambiguous title abbreviations'. This added identifier, inserted in round brackets after the serial title abbreviation proper, can represent a place or a body, and is to be abbreviated as required and according to the Word-Abbreviation List. As to place as an added identifier, the standards have shifted the emphasis from that of earlier versions, and suggest that a larger unit, a country, state or province, etc., as appears most suitable in the circumstances, should be used instead of a city. This has come about because of the increasing tendency for serials to change their place of publication at frequent intervals, or to be published simultaneously in several places (not always in the same country, unfortunately for the abbreviator, and I admit that the standards have not spelled out what to do with this situation; I would think that the place closest to the abbreviator should be the one to be selected), or they may be published by a commercial firm on behalf of a sponsoring body located somewhere else, which always seems to set up a conflict as to what is the precise place of publication. I might add that with the increase in serials emanating from the developing countries, the name of a country would convey more useful information than what might well be an unfamiliar city name; or even a familiar city in an unfamiliar linguistic guise. There is also the case of 'official' publications, where the name of the jurisdiction is clearly more suitable than the precise city of publication, even if it happens to be the capital. A city, of course, would need to be used in the case of identical serial title abbreviations emanating from the same larger unit.

An alternative form of identifier is the sponsoring body. The standards say: 'Use the name of the organization responsible for the content of the publication, abbreviated according to the rules of this standard, instead of the place as the added

identifier, if the place name does not distinguish between conflicting abbreviations, or if the organization name appears to be more suitable for added identification'. This form of identifier is inevitably lengthier than a place-name, but is often more useful and informative if such an identifier is required. For example, it is a moot point whether the *Journal of Documentation* published in London by Aslib would be better abbreviated as *J. Doc. (GB)* or *J. Doc. (Aslib)*; but clearly the body would be better than the place in the case of so generalized a title as *Journal of Science*, issued by the Panjab University. And the body would be essential as the identifier in the case of a journal sponsored, say, by an Australian university and published on their behalf by a Dutch publisher; the 'correct' place of publication would be completely misleading in such a case. Another case where the body is to be used as an added identifier is where a group of initials representing the name of the sponsoring body forms part of the title; if 'distinction or clarification of the title abbreviation is required', the full name of the body is to be determined, and appended to the title abbreviation in round brackets, itself abbreviated as required. This is not necessary in the case of groups of initials for widely known international organizations, such as WHO or ICSU.

There was for a time a stylistic difference between the American and British positions on this point: the original American drafts allowed the bracketed amplification of the group of initials to be inserted into the title abbreviation, immediately following the group of initials, thus: *RCN* (React. Cent. Ned.) *Meded.* I mention this particular example, since the National Central Library's Periodicals Section once received an interlibrary loan application for a serial identified as 'Meded.', and when it was pointed out to the applying library that this was an inadequate reference, they returned a photocopy of their source of reference, showing just the above example: the interpolation, which happened to be in a different typeface from the 'true' title abbreviation, had misled them into thinking the second part alone was the title reference. This piece of carelessness on the part of the library concerned is not, unfortunately, so rare that it can be disregarded by documentalists, but the main reason the British preferred placing the bracketed phrase at the end of the 'true' abbreviation was to make clear the correct form of the abbreviation and hence of the original title, and for consistency with the application of the body name as an added identifier in a case where the title concerned was otherwise 'distinctive'. The American draft for a time recommended a practice which would have avoided the sort of problem of identification mentioned above by requiring that the same typeface should be used throughout an abbreviation with the amplification of the body interpolated, but at a later stage agreed to adopt the British position on this question. I should mention that the standards are perhaps avoiding a logical application of the 'corporate author' principle to a title containing a group of initials representing the name of a body; but presumably the correct form in such a case would be: *React. Cent. Ned., RCN Meded.* and certainly not: *React. Cent. Ned., Meded.*

Some general comments on the matter of style as outlined in the new standards: the British standard has abandoned its previous position on the use or non-use of capitalization to indicate nouns as against other words in the abbreviation, and the criterion is now consistency. The first element of the abbreviation must begin with a capital letter; for the rest, the first letter of the succeeding elements should be capital-

ized (or the abbreviation capitalized throughout), or capital letters are dispensed with entirely after the first initial letter. As for punctuation, all abbreviations are to have a final full stop, whether formed by truncation or by contraction. The latter form of abbreviation is intended to be restricted to a minimum in any case, but where the last letter of the original word is retained, a full stop is still required to indicate that it *is* an abbreviation. Commas are mandatory in the case of an abbreviation based on a corporate author entry, to separate the abbreviated form of the main corporate unit from its subordinate, and the latter from the title word or phrase proper, except where the original title happens to fall into this order, when commas are omitted. Commas are to be used to separate the main title abbreviation from that of a section, or of a secondary title. Other punctuation may be used if it adds clarity.

The standards will have something to say on the matter of diacritical marks, *viz.*, that they may be omitted from title abbreviations, and the recommendation is that the spelling of the words affected should not be modified in consequence. Since it is a practice of fairly general occurrence to make such a modification, however, the standards will allow for it, but require that the practice must be clearly indicated to the users of the abbreviations concerned, and the precise range of forms affected should be specified. It is not, of course, the business of the standard to comment on the use of diacritical marks as such, but I should like to make the personal comment that their general reduction or removal would be a most valuable reform for the languages affected, in an increasingly mechanized and internationalized world. I apologize if that remark sounds like arrogance in one whose native language is virtually free from at least this linguistic complication; perhaps the two revised standards are also guilty of a somewhat wider framed arrogance in stating that 'titles printed in non-roman alphabets are transliterated into roman characters according to recommended standards, and then abbreviated according to the rules. . .'

I should like to say something now about the possibility of wider application of the principles expressed in these standards than to serial title abbreviations. Besides allowing them to be applied to different forms of title entry, where the name of a sponsoring body appears in a concrete title or needs to be incorporated into an otherwise incomplete title, the standard states that the principles may also apply 'to the titles of non-serial publications, including monographs and proceedings of meetings. They may [also] apply, if required, to corporate and conference names in isolation'. Any such use of the principles would certainly require a *clear* indication to the users of abbreviations as applied to other forms of publication, or other forms of 'data element', of the range of the particular set of abbreviations presented. As it is, the provisions of the standards on serial title abbreviations may be applied to a corporate name associated with a particular title, in the rules concerning the use of the sponsoring body as the added identifier. Strictly speaking, the title abbreviation alone is the 'true' abbreviation, and the body name is a piece of added information. It has to be admitted that this added identifier can produce an 'abbreviation' which is longer than the title abbreviated; especially since the standards also suggest that, though single-word titles exclusive of an article are never abbreviated, they can be differentiated if required by an added identifier of place or body. An example of a case where this is clearly desirable is that of two serials which appeared new in early 1968,

both under the title *Ceres*. One of these is issued by the Home-Grown Cereals Authority in London, and the other by the FAO in Rome, though the latter had previously appeared in a single issue as *FAO Review*, a form now used as a subtitle. Here the sponsoring bodies are clearly the more satisfactory form of added identifier, and equally clearly an added identifier is required, though the principles of abbreviation could be said to be going beyond their proper field of application in this case.

Certainly there are dangers in permitting a wider application of the principles of serial title abbreviation since, as I have indicated, there is a strong tendency even in professions which should know better to misinterpret citations, but, if properly applied, the advantages of extending a standardized system should outweigh the dangers. Great care, naturally, should be taken in preparing a 'mixed' system, where titles of serials and of monographs and also of conference proceedings might be cited in the same context. Underlining or italicizing should be used to distinguish titles of serials, series, and conference proceedings from the titles of articles or papers, or of monographs and research reports issued in series, while names of bodies and of conferences, if not part of a title, should appear in an appropriate place in round brackets. Names of personal authors presumably present no problem, and should not, of course, be abbreviated, other than reducing forenames to initials if desired or if appropriate to the language concerned. Another possible application of the principles of serial title abbreviation would be to *subject* words, again if such application of the abbreviations were clearly indicated to the users of the abbreviations concerned.

One area where the principles of serial title abbreviation as expressed in the revised standards will probably not apply, at least not in all respects, and where a separate Word-Abbreviation List will be required, is in the provision of abbreviations for 'Typical Words in a Bibliographical Reference'. This is the phrase describing the project under consideration both by BSI and by ISO, but the phrase itself is something of a misnomer, since what is meant is the abbreviation of typical bibliographic descriptors: the kind of words that are required in descriptive cataloguing or bibliography, and not in fact in what is generally known as a 'bibliographic reference' or citation.

I hope that I have said enough to give you some idea of the utility, both immediate and potential, of the revised British and American standards. They do not solve certain other pressing problems in documentation, nor are they intended to; but a thorough-going national system of documentation standardization should also concern itself with problems anterior to the assigning of abbreviated forms. These problems could be attacked at source, by the production of a standard like the British BS 2509, which first appeared in 1959, and of which a revision is also to appear this year. The title of the revised standard will be 'Presentation of Serial Publications, including Periodicals', and it is aimed primarily at editors and publishers. There is, of course, an ISO standard in this area, and there are some equivalent national standards; where they do exist, librarians and documentalists should see that they are made known to editors and publishers in their own country, and they should use any means of persuasion they can to discourage these sources from unhelpful practices. I diffidently suggest that the revised BS 2509 might be worth consideration in this connection.

Where the revised BS 2509 is particularly relevant to the problem of serial title

abbreviations is in its considerable detail on the form of title under which a serial publication is issued, running to ten points, beginning with the proposition 'a serial title should be concise and clear'. These ten points are intended to give guidance on how publishers could avoid generating 'problem' titles, and perhaps even draw their attention to the fact of which they might otherwise be unaware: that they are causing problems. For example, in the case of multilingual serials, some publishers will provide titles in each of the languages of the text, and these presumably have equal validity in identifying the serial; also, presumably, abbreviations based on these titles would have equal validity. It is perhaps unfortunate that the revised standard did not simply say that a serial should have only one title, whether or not it contains text in various languages; but since multiple titling is so general in serials aimed at an *'international' audience, it was felt that this particular standard could do no more than* lay down certain ground rules for publishers to consider, at least to minimize if not remove the problems caused by this practice. The standard also has a comment in this connection on the case of, for example, a Japanese serial whose text is entirely in Japanese, but where the publishers have helpfully added a translation of the Japanese title in, say, English. Librarians and documentalists may seize on this title as the most convenient way of identifying the item in their catalogues, etc., but this is hardly helpful, whether the added title is cited in full or in abbreviated form, as it no doubt gives the impression that the text of the serial will be as accessible as the form of title given. The standard's advice, that such an added title should on the title page be clearly given the status of a subtitle does not solve, but might perhaps alleviate, this problem.

The revised BS 2509 will also discuss the matter of the way in which a sponsoring body's name should be given in a title; no particular style is recommended above others, but it is recommended that such a title should be 'self-contained', and that the name of the sponsoring body alone should not be provided as (or in place of) the title. Of course, if the rules given in the *Anglo-American Cataloguing Code* regarding corporate author were really universally acceptable and self-evidently desirable, the standard should have recommended some sort of 'disintegrated' title from which a corporate author entry could be constructed; this would require the name of a body at the head of the title page, followed by the name of any subordinate body, and beneath that some neutral and unqualified generic term such as 'Bulletin' or 'Proceedings'. There are languages, as I have indicated, that use this order of data elements in a self-contained title, *e.g.*, *Ankara Universitesi Tip Fakültesi Mecmuasi*; but there are also plenty of examples of title pages which separate the elements required to form a 'title' as I have described it, though sometimes from their layout leaving a considerable degree of doubt as to whether the title in fact begins with the name of the body.

A self-contained title is, however, the most common, even the most 'normal', and certainly the most useful kind of identifier of any publication, serial or otherwise. The difficulties caused by imprecision in this respect, and many publications issued under the jurisdiction of a government department are guilty of this, are all too well known. It seems to me that publishers and editors should be urged to tre
of their works with the utmost degree of punctiliousness, whether

ports, monographs, or serials, or articles or papers contained in a more compre-
ensive publication; it should follow that librarians and documentalists should then
e them as they appear on the title page (or equivalent) for all forms of citation and
itry, even to the extent of treating them as the principal data element required for
entification. Then the principles of title abbreviation, as outlined in the revised
andards I have been describing to you, could be safely and usefully applied to all
rms of title. It is, no doubt, too much to expect that publishers and cataloguers will
iange their ways very rapidly; however, appearance of the British and American
andards on periodical title abbreviations should, if their example is widely followed,
move some of the difficulties of documentation on a national and an international
vel, in this area at least.

In conclusion, I should like to say something about the Word-Abbreviation Lists.
hese will be published separately from the principles, though they are, of course,
timately linked; indeed, from the point of view of day-to-day use, it is the Word-
bbreviation List that is most required. Separation, however, will allow the principles
be published without delay, and will also be more convenient in the future, since
ie List will need much more frequent updating than — presumably — the principles.
s I told you, work is proceeding as expeditiously as possible in reconciling existing
ifferences in the abbreviated forms currently used as between the Americans and the
ritish, and it is hoped that the publication of the revised Word-Abbreviation List
ill follow close upon that of the principles. As for the updating of the List, there are
idications that this will proceed with an even wider range of continuing international
)-operation. It is with this encouraging prospect of increasing international stan-
ardization, in at least part of the field of documentation, that I now close.

standardization for interchange of cataloging records — marc II

F. G. Kilgour

MARC II is a standardized format for communicating bibliographic information. It derives from a more general draft standard: 'USA standard for a format for bibliographic information interchange on magnetic tapes' (1969). MARC II does not yet provide for interchange of machine-readable bibliographic records by transmission media such as telephone circuits, and it will never prescribe standardization of records for use within local files. MARC II will remain a standard for communication.

Library standards for cataloging records fall into two major groups; one is concerned with physical properties of the record, the other with its bibliographic content. The physical standards are entirely oriented toward library manipulation of the records, while bibliographic standards should ideally facilitate the library patron's use of records. The major objective of the group of librarians in the U.S.A. that established the ALA nearly a century ago was achievement of library co-operation in general and co-operative cataloging in particular. As Melvil Dewey said about co-operative cataloging in 1877, 'There has been no subject oftener in the minds of thoughtful librarians. . . .' Co-operation requires standardization, and the first major objective of the ALA was standardization of bibliographic format and content of printed catalog records, and standardization of size of card on which to interchange and store those records.

The ALA Co-operation Committee announced in 1877 that dimensions of the standard catalog card would be 5 × 12.5 cm; the 7.5 × 12.5 cm card began to be adopted in the first half of the 1880s (Dewey, 1886). Prior to acceptance of a standard card size, each library arranged for manufacture of cards of a size originally chosen by some subjective or mystical process and arranged for a cabinet maker to build a catalog case having drawers of unique size to house its particular cards. These practices were expensive and made it impossible, with the exception of coincidence, to interfile cards from another library. A standard card size reduced cost of cards and cabinets, but of greater importance it facilitated use of cards, and therefore cataloging information, produced at another library.

As far as interchange of catalog cards is concerned, the MARC II standard is directly analogous to standardization of bibliographic format and catalog card size, but not bibliographic content. As noted in the first paragraph, the MARC II Communications Format derived from the more general 'USA standard for a format for bibliographic information interchange on magnetic tapes'. The draft standard was the work of the Subcommittee on Machine Input Records of the USASI Standards Committee Z39 on Library Work, Documentation, and Related Publishing Practices. Under the able chairmanship of Henriette D. Avram, this Subcommittee has been working on definitions of the standard since 1966. The introduction states its purpose: 'This Standard defines a format which is intended for the *interchange* of bibliographic records on magnetic tape. It has not been designed as a record format for retention within the files of any specific organization. Nor has it been the intent of t

Subcommittee to define the content of individual records. Rather, it has attempted to describe a generalized structure which can be used to transmit between systems, records describing all forms of material capable of bibliographic descriptions as well as related records such as authority records for authors and subject headings.'

The Subcommittee sought to design the format so that it would have four major properties. First, it is hospitable to all kinds of bibliographic information. Second, a large variety of digital computers can use the format. Third, the format has a uniform structure that provides basically identical machine records and includes such control information as may be required to specify unique characteristics of records. Fourth, the methods of recording and identifying bibliographic data provide maximum manipulability and therefore ease of conversion to other formats.

The standard record consists of four separate sections. The initial 24 characters of the record constitute a leader in which can be stored information about various characteristics of the record. Next, there is a variable length directory which provides information as to the location and length of elements of control information and bibliographic data in the record. For example, the directory will include the location of first character of the field containing the bibliographic title and the length of that field. Control fields are the third section, and they contain such information as a control number, which is unique for each bibliographic record, date the record entered a file, date of publication, language of the bibliographic unit described, etc. Last, there is the data field that houses the bibliographic information.

The June 1969 issue of the *Journal of Library Automation* will publish the draft 'USA standard' together with two implementations. One, a working paper, is an implementation of the standard proposed by the U. S. Government's COSATI. The second, entitled 'Preliminary guidelines for the Library of Congress, National Library of Medicine, and National Agricultural Library implementation of the proposed American standard for a format for bibliographic information interchange on magnetic tape as applied to records representing monographic materials in textual printed form (books)' is better known as MARC II.

The principal goal of MARC II is to facilitate interchange of machine-readable cataloging information. At the present time this interchange is limited to machine-readable cataloging records on magnetic tape, but it is expected that the 'USA standard' will be elaborated in such manner that in the future MARC II will also encompass interchange of individual bibliographic cataloging records on telephone circuits. By 1966, when the Standards Sub-committee on Machine Input Records began its labors, there were already a half-dozen major different formats for machine-readable catalog records. If proliferation of machine-readable formats had continued, there would have come into being an impenetrable jungle of incompatible library computerizations. Just when the library profession was finally acquiring a tool that could make possible effective co-operation involving free flow of bibliographic information, the form of that information was rapidly degenerating into a chaos that would have stoppered the free interchange of catalog records more effectively than had card catalogs a century ago. The library profession will be eternally grateful to the Council on Library Resources, to the Library of Congress, and to Mrs. Avram for averting an impending disaster.

It is of the utmost importance to understand that MARC II, like the 'USA standard' from which it derives, has no concern whatsoever with standardization of cataloging data contained within machine-readable records; and it is of equal importance that it be clearly understood that MARC II in no way is concerned with local processing of machine-readable cataloging records. However, if an institution is to participate in interchange of cataloging information, it must be able to generate MARC II records from the format which it uses in its local processing. As a clear example of this difference, the Library of Congress does not use MARC II in its own processing, but rather a 'MARC processing format' (Avram, 1968). Nevertheless, the Library of Congress generates records in MARC II format from its MARC processing format for the MARC distribution service.

origins

It is perfectly obvious that the MARC II record did not evolve from the 7.5 × 12.5 cm catalog card with or without a rod hole; it is a totally different type of vehicle and form. Apparently, the first use of a machine-readable bibliographic record on magnetic tape was about 1957. The oldest system employing machine-readable cataloging records is that which has been in continuous use at the Missiles and Space Systems Engineering Library of the Douglas Aircraft Corporation where operations first began in May 1961 (Koriagin, 1962). In January 1963, representatives of the Columbia, Harvard, and Yale medical libraries convened at the Harvard Medical Library to work out basic design of a machine-readable cataloging record, and at about the same time the University of Toronto and Florida Atlantic University were initiating similar activity. The format of these machine-readable records together with experience with them contributed to the original MARC record.

The first of a series of general meetings at the Library of Congress that led to the MARC project occurred on 11 January, 1965, under sponsorship of the Library of Congress, the Committee on Automation of the Association of Research Libraries, and the Council on Library Resources A second meeting on 22 November, 1965, encouraged the Library of Congress to explore problems involved in recording of bibliographic data in machine-readable form, and in December the Council on Library Resources awarded the Library of Congress a grant of $130,000 to initiate such a project, which became the MARC Pilot Project. Experience with the MARC Pilot Project and with other projects at other centers has been the basis for definition of the 'USA standard for a format for bibliographic information interchange on magnetic tapes' and its derivative MARC II.

Because the 'USA standard' and MARC II were coming into being at the same time, and because the 'standard' is more generalized than MARC II, it has so far been necessary for the Library of Congress to change the MARC II format on several occasions as the 'standard' incorporated requirements of other national libraries, the British National Bibliography, and particularly the requirements of more specialized organizations in science and technology. Standardization is an on-going process, and it can be expected that, in contradistinction to the 7.5 × 12.5 cm catalog card, MARC II will change. However, computers, unlike catalog card drawers, are tremen-

dously flexible devices which will make possible, and even encourage, evolution.

The MARC II format is primarily designed to yield classical products derived from cataloging records. It is likely that during the early years of MARC II use catalog cards will be the principal product. Bookform catalogs will not rival the popularity of catalog cards, but tags, indicators, and subfield codes employed in the MARC II design are adequate for bookform catalog production. MARC II records will also be used to produce bibliographies, acquisitions lists, and SDI. Because the greatest anticipated use of MARC II records is for catalog card production, MARC II provides for classical cataloging data. However, it is not anticipated that development of machine-readable catalogs organized in an entirely different manner from card catalogs will be hindered; it can be expected that MARC II data will fit into novel catalog design, but that the new catalogs of the future may not be able to produce card catalogs.

applications

Contents of the MARC II tapes as they now appear this year will be primarily English-language, U.S. imprints. The Library of Congress is making a determined effort to achieve complete inclusion on the tapes of all of its cataloging of U.S. imprints. In the future, contents of the tapes will be expanded to include cataloging for other English-language imprints as well as for non-English imprints. Such developments require large amounts of planning and effort, so that it is not possible to schedule them precisely.

In North America, machine-readable cataloging records on MARC II tapes will probably soon be used for catalog card production at various centers including the University of Chicago, the Five Associated University Libraries in New York State, the NELINET System in New England, The Ohio College Library Center, Stanford University, the University of Toronto, and Yale University. Since the majority of these institutions already have computer programs processing catalog records in other than MARC II format, it is most probable that they will transliterate the MARC II format into their own formats to avoid the expense of rewriting existing programs. Some of these institutions will also use MARC II records for other library operations, including remote catalog inquiry by users. There are, of course, a host of other libraries in Canada and the U.S.A. now employing computers, and it can be anticipated that, as far as catalog production is concerned, most will convert to use of the MARC II record. Flow of MARC II records will not remain unidirectional from the three U.S. national libraries to other libraries. Rather, as a future library network develops in Canada and the U.S.A., some, if not most, libraries will be adding MARC II records to the data base available to the network.

In the U.K., the BNB has taken leadership in use of MARC II records (Coward, 1968). BNB will employ them to produce its *Bibliography* and catalog cards for its card service. BNB will soon initiate a pilot project for utilization of British MARC tapes that BNB is already producing. Library of Congress MARC records will be added to the British file. BNB tapes will go to a score of British libraries that have various plans in various stages of formulation for use of the tapes.

original cataloging employing marc II

The computer cannot be programmed to understand the sophisticated meaning of the various categories of data on a catalog card. Therefore, it is necessary for a human being to assign to each category of bibliographic data a label unique for that category. In other words, the string of characters which spell out an author's name are given a unique label, which in the case of the MARC II system is '100'. This label is always used when the main entry is a personal name. It is then possible to instruct the computer to perform certain operations on the physical string of characters to which is attached this '100' label.

The principle for use of labels is easily understandable. Each string of characters which represents a specific category of bibliographic data, such as author or title, must have a unique label. To identify within each category a string of characters that represents an element of bibliographic data, such as an author's surname or a short title, there must be unique labels that cannot be confused with characters representing data.

Descriptive cataloging for production of MARC II records is somewhat different than that for the direct production of printed cards. The principal difference is addition of certain information on a cataloging worksheet not necessary on a printed card. For example, it is necessary in preparing copy for machine-readable cataloging to identify the language of the record; on a catalog card language is implicit. Descriptive cataloging, *per se*, can follow the same rules used for classical cataloging records whatever those rules may be, and the *MARC Manuals* (Library of Congress, 1969) furnish full directions for coding for conversion to MARC II format. The worksheet on which cataloging information is recorded may call for a different arrangement of bibliographic data in contrast to previous procedures, or, for that matter, to other computerized procedures. In some classical and computerized techniques, the body of the title on the worksheet includes title, author statement, edition statement, and imprint; in the MARC II format, title includes only title and author statement, there being a separate category for edition statement and for imprint. The cataloging data within each category is determined by cataloging practices as already mentioned and not by MARC II format.

Once descriptive cataloging has been recorded on a worksheet, it is then necessary to add codes, so that the computer can identify each bibliographic category and elements within a category. In some libraries, catalogers add these codes; in others, individuals, often students, code sheets after catalogers have completed them. At the Library of Congress a group of editors add the codes. In a published study of time required for coding for a somewhat simpler coding system than MARC II, titles required an average of 27 seconds (Kilgour, 1968).

The code for each data category, or field, in MARC II consists of a tag and an indicator. A tag is three numeric characters, and the indicator occupies two positions, either or both of which may be blank; in all, the field code is five positions. Subfield codes occupy two positions and consist of a non-data character (which for the sake of representation in MARC documents is depicted as a dollar sign) plus a lower case Roman letter.

A brief example of MARC II cataloging is demonstrated with the following imprint:

Amsterdam, Excerpta Medica, 1969.

Since the tag for imprint is 260, these figures will occupy the first three positions of the field code. In the case of an imprint, the first position of the two-position indicator shows whether or not the publisher is the main entry; if the publisher is the main entry a '1' is used, if not, a '0' (zero) is inserted. The second position in the indicator is always blank. Therefore, the field code might read as follows:

Amsterdam, Excerpta Medica, 1969. 2601ø

where the 'ø' is a blank. There are three subfield codes used in imprint: '$a' designates place of publication; '$b' designates publisher, and '$c' labels the date. The completed MARC II imprint is:

$aAmsterdam, $bExcerpta Medica, $c1969. 2601ø

If an editor, rather than a cataloger, is doing the coding, it is necessary for the cataloger to remember to leave a couple of spaces between elements of the imprint.

Although the MARC II system contains what at first glance appears to be an enormous number of tags, indicators, and subfield codes, only a few of these codes are used in the vast majority of catalog records. After having cataloged ten books by a single personal author, any cataloger should be able to do an eleventh without reference to a list of tags, indicators, and subfield codes. In the case of exceptions to the general run of cataloging, it will, of course, be necessary to look up the indicator or subfield code required; it will not often be necessary to consult the list of tags, which are relatively easy to remember.

the future

The library catalog of the not-too-distant future will be a machine-readable catalog to which access will be obtained from a remote terminal, which might be a variety of touch-tone telephones. It now seems likely that card catalogs and book-form catalogs will be discontinued in some libraries during the 1970s. Indeed, the Stanford University Library already has an experimental catalog in pilot operation. Searches of the Stanford catalog have been initiated from a terminal in Columbus, Ohio, 2,000 miles distant, and listings of bibliographic data were received, on the average, in less than two seconds on the Columbus terminal.

Stanford will use MARC II records transliterated for storage in its on-line file. The Stanford file uses an interesting technique in its organization, wherein a numeric position in the file is calculated by the computer from relatively few alphabetic characters in the catalog record. Several investigators are studying this technique of employing just a few characters in the record to compute a position in a huge file of perhaps ten million bibliographic records. Such a procedure makes possible toleration of a large amount of error in cataloging data as well as in requests, and relieves librarianship of the burden of determining main entries in accurate accord with an authority file. At the same time, the user is relieved of the difficulty of finding his way among entries arranged according to complex filing rules.

Investigations are in process that seek to determine bibliographic information

known to a user when he starts to search for an item in a catalog. It will be necessary to have a knowledge of minimum data possessed by a user at initiation of a search to design the on-line catalogs of the future. Sufficient work has been done on file organization and catalog usage to enable a prediction that a user will need to know relatively little of the bibliographic description of the item he seeks in order to retrieve the description from an on-line catalog.

MARC II cataloging records contain more than adequate flexibility to achieve complete compatibility in on-line catalogs of the future. Although MARC II is primarily designed to facilitate production of the bibliographic tools of the past and present, it must also be looked upon as a sturdy pier that will support the bridge to the future.

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use of the library of congress' marc II format for a union list of serials*

T. H. Rees, Jr.

It was Mr. Fred Kilgour, who so ably recounted (this volume, p. 103) the development and use of the basic MARC II standard in his talk before this group this morning, who suggested that the 'Union List of Scientific and Technical Periodicals in the Cincinnati Area' should be done in a format which could be converted to the MARC II communications format. This was in May 1968, when the Cincinnati Chapter of the Special Libraries Association was applying for a Library Services and Construction Act, Title III, grant from the State Library of Ohio. He further suggested that computer programs for producing the union list on magnetic tape from IBM cards, and for exploiting the tape once produced, be included as part of the project. This we agreed to do. Our experiences in connection with this effort are being reported in this paper.

The current list is the third edition of such a union list produced by the Cincinnati SLA chapter. There are 49 libraries whose holdings are included, of which 21 are medical or at least paramedical. There will be approximately 7,000 titles in the list, with an average of 1.6 libraries holding a title. It is estimated that some 1,700 to 2,000 'medical' titles are included.

methods

A volunteer committee of the SLA chapter has been working for a number of years, collating the holdings of the various libraries behind title cards. One of the editorial decisions that was made early in the project was to use a straight title entry, rather than an inverted, corporate entry. It was felt that library patrons, many of whom use the present 'Union List' themselves, at least in the University of Cincinnati Medical Center Libraries, are accustomed to looking for journals by title, as was pointed out by the late Ralph Esterquest (1960), and a number of other medical librarians, in an article in the *Bulletin of the Medical Library Association*. Therefore, the title entry as established in the *WLSP* was decided upon as the standard. It was also decided that bibliographic information, such as the year the first volume was published, the place of publication, the editor(s), etc., would not be included, under the assumption that this information was readily available elsewhere, and was not needed in what should be essentially a finding list for journals. If another organization would care to do so, it could take our records as a base and add such other bibliographic information in the MARC II format.

Since the MARC II magnetic tape format can be arrived at by a number of means, and in fact has apparently not been done elsewhere card-to-tape (the Library of Congress is converting from paper tape to magnetic tape; Ohio State University is

* Work reported herein was supported in part by a Library Services and Construction Act, Title III, grant from the State Library of Ohio.

going to do keyboarding directly onto magnetic tape in a non-MARC format which is, nonetheless, convertible to MARC II), the IBM card layout is rather immaterial, as long as it is consistent and particularized so that the information can be consistently converted to the MARC II format.

The card format we decided to use has an eight-digit identification number for each title, for a reason to be mentioned later, followed by a three-digit tag to identify the type of information in the field, followed by the information. On title cards, to which we have assigned the tag of 245, the title starts in column 12 of the IBM card and runs out as many spaces as necessary. If a title is more than 69 spaces long, it is continued on a second card. The holdings cards are the same for the first 11 columns, except that the arbitrary tag of 950 is punched in columns 9-11 to signal holdings. The code for a given library is punched in columns 12 and 13, two columns are skipped and the volumes held by that library are punched starting in column 16, continuing out to column 40, if necessary. If there are a lot of gaps in a library's holdings of a given title and more than 24 columns are needed to specify the volumes held, a second card is used. Years of publication corresponding to the volume numbers are punched in columns 41 through 80, again continuing onto a second card if needed. The other types of information we have included are bibliographic notes, *e.g.*, 'Title changed from . . .', with an assigned tag of 503 and *See* references from the inverted form of entry to the straight title form, with a tag of 740.

Since the Library of Congress has not yet published the list of tags and other rules for serials in the MARC II format, we have used those mentioned above. In the case that they do not agree with the approved list, when published, it will be a simple matter to transliterate the ones we have used to the official ones when converting from cards to tape.

We thought that it would save a lot of keypunching if we could use pre-punched title cards. We therefore got a copy of Wayne State University's serial record on magnetic tape and wrote a small program for the IBM 1401 to punch title cards from this. Nine boxes of IBM cards were produced, with an eight-digit serial number (mentioned previously), three blanks (which proved to be ideal for inserting the tag), and the title. This has not proved to be as useful as originally thought, as there is not much overlap in titles in the two lists, partly due to Wayne State University's use of the corporate form of entry and partly due to the Cincinnati list being limited to science and technology. Only 40% of the titles in the Cincinnati list are included in the Wayne State University list.

Since, as mentioned previously, no one has gone from IBM cards to the MARC II format, a system of operations was flow-charted in which all procedures could be handled by one large computer program, controlled by header cards preceding each type of data for change to be made on the magnetic tape. These procedures include originating the tape, making corrections in holdings, adding new titles, deleting holdings, and listing the tape in various formats. The programs to accomplish this card-to-tape conversion, updating, and correcting are being written in SPS for a 4K IBM 1401 and in PL/1 for an IBM System 360/50. The various parts of the programs are still in the process of debugging, but will be made freely available to anyone interested, with accompanying documentation, when finished.

results

Early in the keypunching process we experimented with different methods of keypunching title cards. The Wayne State University title cards had been listed as they were punched. This list was checked against the Cincinnati list of titles, which was on 3 × 5 cards, and the titles found in the Wayne State list were flagged. The file of IBM cards was then flipped through and the card for a 'found' title was pulled and filed behind the 3 × 5 card. As a pre-punched card was arrived at, it was inserted into the keypunch, the tag for title was punched in the appropriate columns, and the serial number was then duplicated into each following holdings card. With this method, cards for 0.64 titles (with holdings) per minute could be processed, or a total of 2.03 cards (titles, holdings, and notes) per minute. Serial numbers for titles which were not in the Wayne State list were interpolated into that sequence, written on the 3 × 5 card, and punched by hand, with the title.

The second method tested for speed was to check the printed Wayne State University list against the 3 × 5 cards of the Cincinnati list, writing the Wayne State serial number on the 3 × 5 card if found and interpolating into the Wayne State sequence if not found therein. The pre-punched cards were ignored, except that they had served their purpose of supplying a serial number for the 40% of the titles mentioned earlier. Using this method, 1.1 titles per minute, or 2.82 cards per minute, were punched. (The figures in both of these methods included the time necessary to find, or interpolate, the serial numbers and/or the actual IBM cards.)

The third method was to ignore the Wayne State serial number and to punch in the tag for each card and the information on each. The serial numbers were punched into the cards later, on an IBM 1401. Using this method, 1.48 titles per minute, or 3.96 cards per minute, were keypunched. These three small test samples verified what has been reported by a number of others, that it is almost always faster to do your own keyboarding than to try to use someone else's product and to feed it into your system.

Keypunching was not verified by re-keyboarding, but by eye, reading off the 3 × 5 card and checking against the list printed from the keypunched cards. This had the added advantage of picking up errors of transcription, in which a given library reported its holdings as beginning in a year in which the journal was not published, as compared with other libraries' reported holdings of the same journal, or of similar types of error. With the information having been reported by the various libraries over a period of years and having been collated behind title cards at various times, the consistency from one library to another of the correct year of volume 1, etc., was not checked, except at the time of verifying.

Lists obtainable from the MARC II tape include a regular listing of all titles and all holdings, a list of titles and holdings of any one specified library, a list of titles that are filed under another form of entry (*See* references), and anything else that can be thought of concerning the information on the tape.

discussion

From our experience, the Library of Congress MARC II format seems to be well suited for a union list of periodicals. The format is flexible enough and complete enough to include any data elements connected with serials. The fact that the 'Union List of Scientific and Technical Periodicals in the Cincinnati Area' made use of only a small number of the possible tags does not preclude the possibility of our going back and adding more data to the original file, if we or others think that it would be useful and economically feasible.

As mentioned before, we will be happy to share the programs and documentation, and the data in the MARC II format, with anyone interested.

reference

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a file structure for an automated library catalog*

R. T. Divett, W. W. Jones and E. S. Dahl

In his presentation, Mr. Frederick Kilgour (this volume, page 103) put forth the concept of the future use of on-line computer terminals in place of the traditional card catalog. The following presentation describes computer concepts that will enable use of the computer in this manner. This file structure may also be used for all library operations (acquisitions, catalogs, circulation, etc.), and programs can be written to input MARC II materials and MEDLARS information into the system.

the automated index

A library may be thought of as comprising essentially an anthology and an index thereto. This index customarily takes the form of a number of drawers filled with 3 × 5 cards, the card catalog. The card catalog may be ordered as a dictionary catalog, in one file, with author, subject, and title cards interfiled; or as a divided catalog with multiple alphabetical files. Searching the card catalog can be tedious, imprecise, and even frustrating. Conceivably, this operation can be improved and automated through use of the modern-day computer. Manifestly, the shape of the index must change somewhat to enable automation, and it is with this new shape that the current discussion is concerned.

This index, as a collection of related data, will be known in the computer lexicon as a file, or file set, and must have the attributes of random accessibility, good and sufficient content, and a degree of machine economy. Random accessibility proceeds from the establishment of an entry point for each author, title, and subject. The content includes bibliographic data, descriptive data, and miscellaneous data. Machine economy is expressed in access time and storage volume. The former is obtained through the selection of suitable storage devices and file organization schemes, the latter through compression (in machine codes), and re-utilization of data elements.

an approach

An asymmetric modular file structure was selected. Conceptually, one module was established for each avenue of entry. Each module was constructed as an index of entry points, a file of data elements, and a chain of loci of related elements. At the focus of these three modules was a common intermodular cross-reference list. Other supportive files, to be discussed later as needed, were included in the file set.

Two organizational schemes were used in this file set: index-sequential and relative. *Index-sequential* organization may be likened to a conventional card catalog wherein the drawer labels constitute an index delimiting the content of each of the

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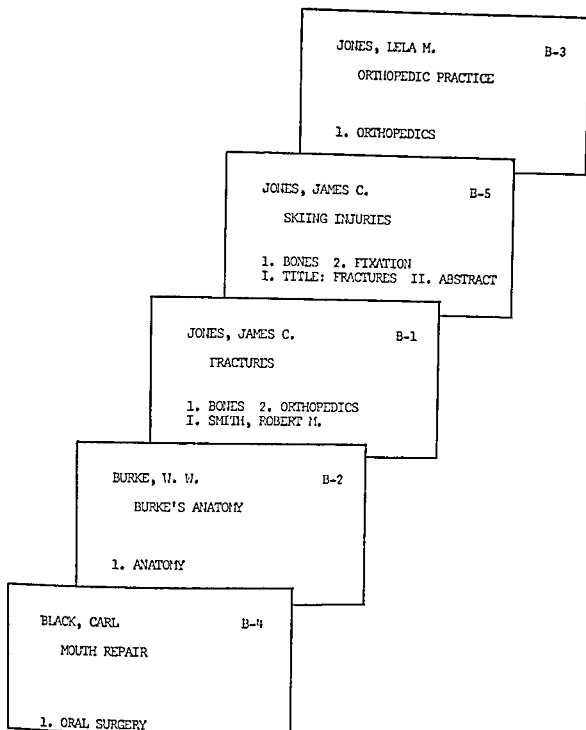


Fig. 1. Card catalog. Sample data for illustrations.

drawers. The reader may scan this index and proceed directly to the proper drawer, then search within that drawer for the precise card desired. In the same way, an index to a computer file may be constructed showing the content of each physical extent of the file. This index may be read to learn the needed extent, the extent then read, and the desired record searched out and presented.

Relative organization is so named because each record may be fetched directly by knowing its physical position within the file relative to the first record, much as a page in a book may be found by page number. Simple computations involving record length and number of records per extent will lead to the extent to be read and the record to be extracted.

Current state-of-the-art dictates that all records within a file organized according to either of these schemes be of fixed or uniform length rather than of variable length. Certain other characteristics of these type files become apparent at this point. In index-sequential files, for example, each record must have its key (the datum by which it is to be found) completely spelled out within the text of the record. Furthermore, this key must be known in perfect congruence before the record can be retrieved. Relative files tend to be more efficient of storage, as the key, being implicit in location, need not be stored in the record and may be referred to as a simple binary number. However, the record number, which cannot be induced from data, must be known before the record can be obtained. The significance of these peculiarities will appear later.

searching concepts

It is appropriate to remember that these files are but tools with which to perform certain tasks. In general, searching, or retrieval, may be said to span three conceptual approaches, all of which must ultimately be shoe-horned into one of a finite selection of physical methods. Identification, the most common type of inquiry in the library environment, is the process of locating an item already known to exist. Isolation, the most complex problem technically, is the quest of an item believed to exist but whose parameters are only imperfectly known. Indagation, or browsing, is the pursuit of an unknown quantity of items, all common within some given constraint.

In library searching, the logical avenues of entry are limited to those of author, title, and subject. Ideally, in the automated system, these could be presented in any combination of logical 'and', 'or', and 'not'. This capability must be a design objective of any computer-based catalog.

It is customary to quantify the results, or output, of automated inquiry into ratios of recall and spurious recall, or fallout. Recall is given as that percentage of all the items which should have appeared in consequence of a given inquiry which did, in fact, appear. Fallout is that portion of all the items appearing which should not have appeared. In the well-designed interactive system, these values would be manipulatable by the queror through the use of 'and/or' gates, acceptance thresholds, or other logical devices. The responsibility of the index designer is merely the enabling of the mechanisms.

ACCESSION FILE (RELATIVE)

ACCESSION NUMBER	FIRST TITLE THIS BOOK	FIRST SUBJECT THIS BOOK	[illegible] THIS BOOK	[illegible] THIS BOOK	[illegible]	[illegible] THIS [illegible]
CONTROL	6	6	7	5	5	12
5-1	2	2	1	3	1	0
5-1	2	2	3	1	[illegible]	[illegible]
5-3	4	5	[illegible]	[illegible]	0	0
5-4	3	4	4	4	0	0
5-2	1	1	5	5	0	0
5-5	2	2	3	3	0	0

AUTHOR INDEX
(INDEX-SEQUENTIAL BY LAST NAME)

LAST NAME	POINTER TO FIRST AUTHOR
BLACK	4
BURKE	5
JONES	2
SMITH	1

AUTHOR FILE (RELATIVE)

AUTHOR	POINTER TO NEXT AUTHOR	ACCESSION FILE INDEX
SMITH, ROBT. H.	0	2
JONES, LELA H.	3	4
JONES, JAMES C.	0	3
BLACK, CARL	0	5
BURKE, W. W.	0	6

TITLE INDEX (INDEX-SEQUENTIAL BY TITLE)

TITLE	POINTER TO TITLE FILE
BURKE'S ANATOMY	1
FRACTURES	2
MOUTH REPAIR	3
ORTHOPEDIC PRACTICE	4
SKIING INJURIES	5

TITLE FILE (RELATIVE)

TITLE	FIRST CHAIN RECORD PTR
BURKE'S ANATOMY	1
FRACTURES	2
MOUTH REPAIR	3
ORTHOPEDIC PRACTICE	4
SKIING INJURIES	5
JONES EXAMINES PROTRACTED FIXATION OF COMMINUTED SHAFT	7

TITLE CHAIN (RELATIVE)

ACCESSION POINTER	NEXT BOOK THIS TITLE	OTHER TITLE THIS BOOK
6	0	1
2	5	2
5	0	3
4	0	4
7	0	5
7	0	7
7	0	2

Fig. 2. Generated data base (part one). Accession file, author files, title files.

SUBJECT INDEX
(INDEX-SEQUENTIAL BY SUBJECT)

SUBJECT	POINTER TO SUBJECT FILE
ANATOMY	1
BONES	2
FIXATION	7
ORAL SURGERY	4
ORTHOPEDICS	5
SPECIALTIES	6
SURGERY	3

ALPHABETIC DICTIONARY
(INDEX-SEQUENTIAL BY SUBJECT)

SUBJECT	NUMBER	NUMBER
ANATOMY	A2.0.0.0	
BONES	A2.2.0.0	
FIXATION	E4.5.2.0	G2.2.6.3
ORAL SURGERY	E4.8.0.0	G2.2.9.0
ORTHOPEDICS	E4.5.0.0	G2.2.6.0
SPECIALTIES	G2.0.0.0	
SURGERY	E4.0.0.0	G2.2.0.0

SUBJECT FILE (RELATIVE)

SUBJECT	FIRST CHAIN RECORD PTR
ANATOMY	1
BONES	3
SURGERY	4
ORAL SURGERY	7
ORTHOPEDICS	8
SPECIALTIES	10
FIXATION	15

NUMERIC DICTIONARY
(INDEX SEQUENTIAL BY NUMBER)

NUMBER	SUBJECT	DECLENSION POINTER
A2.0.0.0	ANATOMY	1
A2.2.0.0	BONES	0
E4.0.0.0	SURGERY	2
E4.5.0.0	ORTHOPEDICS	4
E4.5.2.0	FIXATION	0
E4.8.0.0	ORAL SURGERY	0
G2.0.0.0	SPECIALTIES	5
G2.2.0.0	SURGERY	6
G2.2.6.0	ORTHOPEDICS	8
G2.2.6.3	FIXATION	0
G2.2.9.0	ORAL SURGERY	0

SUBJECT CHAIN (RELATIVE)

ACCESSION POINTER	NEXT BOOK THIS SUBJCT	OTHER SUBJCT THIS BOOK
6	2	1
2	14	5
2	13	3
2	5	6
5	6	4
4	17	5
5	0	6
2	9	3
4	16	6
2	11	1
4	12	3
5	18	3
7	0	1
7	0	7
7	0	5
7	0	3
7	0	6
7	0	2

DECLENSION LIST (RELATIVE)

NUMBER	INDICATOR
A2.2.0.0	0
E4.5.0.0	1
E4.8.0.0	0
E4.5.2.0	0
G2.2.0.0	0
G2.2.6.0	1
G2.2.9.0	0
G2.2.6.3	0

Fig. 3. Generated data base (part two). Subject files, dictionary.

ACCESSION FILE

	ACCESSION NUMBER	FIRST TITLE THIS BOOK	FIRST SUBJECT THIS BOOK	FIRST AUTHOR THIS BOOK	OTHER AUTHOR THIS BOOK	AUTHOR LEVEL	NEXT BOOK THIS AUTHOR
1	CONTROL	6	6	7	8	8	19
2	B-1	2	2	1	3	1	0
3	B-1	2	2	3	1	2	7
4	B-3	4	5	2	2	1	0
5	B-4	3	4	4	4	1	0
6	B-2	1	1	5	5	1	0
7	B-5	2	2	3	3	1	0

AUTHOR INDEX

LAST NAME	POINTER TO AUTHOR FILE
BLACK	4
BURKE	5
JONES	2
SMITH	1

AUTHOR FILE

	AUTHOR FULL NAME	POINTER TO NEXT AUTHOR	ACCESSION FILE POINTER
1	SMITH, ROBERT M.	0	2
2	JONES, LELA M.	3	4
3	JONES, JAMES C.	0	3
4	BLACK, CARL	0	5
5	BURKE, W. W.	0	6

Fig. 4. Retrieve all books by a given author. Given: Jones, James C. Found: B-1, B-5.

the file structure

It is now opportune to examine the individual members of the file set (Fig. 1). The cross-reference list, known as the *accession file*, cannot be inspected directly by the inquiror. It is accessed through the module appropriate to the selected avenue of entry and is used to retrieve data from other modules relating to the same monograph. The accession file is relatively organized and each record carries, as its identification, an accession number. This number, assigned during the library's acquisitions process, is unique to each monograph. It also serves as a pointer to a descriptive file which contains data or pointers to data not stored in the main file set, namely descriptive and miscellaneous data. The accession file further contains pointers to the title and subject modules and serves as the chaining member of the author module. One additional function of the accession file is to carry, in its first record, counters showing the next available position in each of the relative files in the file set. Within the *author module* there are found the author index and the author file. The former is an index-sequentially organized, alphabetically arranged list of surnames of authors, each accompanied by a pointer to the first occurrence of that surname in the author file. The relatively organized author file contains full names of authors, each with a pointer to the next occurrence in the author file of the current surname, and a pointer to the first record in the accession file attributed to this author. That portion of the accession file which is the chaining member of the author module consists of four counters. The first counter is a pointer to the first author in the author file to whom the current monograph is attributed. The second counter points to the next author credited with the work. This item may be regarded as being in a rotary chain in that it may be entered at any point and is completed when the pointer value is equal to the first value returned. The third counter merely distinguishes between only, main, and additional authors relative to the current work. The fourth counter points to the next accession record attributed to the current author. It may be regarded as being in linear chain, in that it must be entered from the beginning and is ended when a value of zero is returned. The *title module* is the simplest of the three, since provision is made for finding only those titles which are perfectly known. Searching techniques for approximately presented or vaguely known titles constitute a study in its own right, which is beyond the scope of this presentation. The title index is index-sequential by title with pointers to the title file. The title file is a relative file with data and with pointers to the title chain. The chaining member here comprises a pointer to the accession record to which the current chain element relates, a pointer in linear chain to the accession record of the next monograph which is known by the current title, and a reflex pointer in rotary chain to the next title by which the current work is known. It is ended when the first used title is again indicated. The *subject module* is logically the same as that for title. The differences arise in that provision is made for a hierarchical structure of subject headings. This latter feature is based on the MeSH of the NLM. (The tree structure utilized in the files was developed by the NLM as a retrieval tool for use in matched mode computer retrieval jobs.) It consists of a dictionary of two index-sequential files, one organized alphabetically and containing reference numbers by which each subject may also be known, the other organized according to

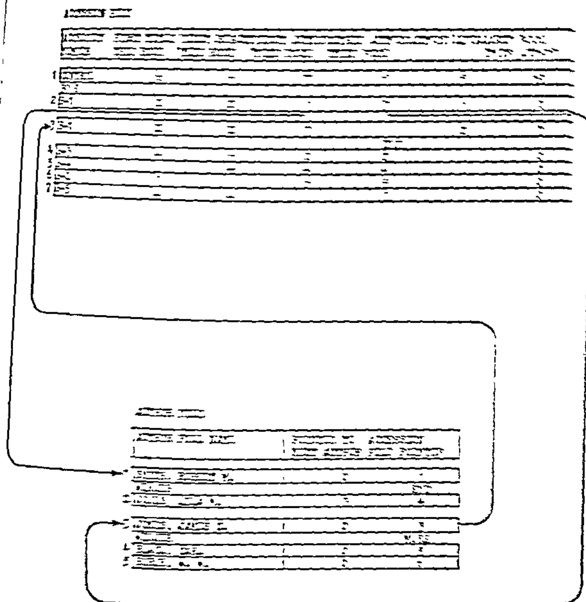


Fig. 5. Retrieve all authors for a given book. Given: B-1. Found: Smith, Robert M. and Jones, James C.

those numbers and containing also pointers to a list of hierarchical declensions. Identification of more general headings may be effected simply by rounding to zero from right to left the consecutive subfields of the current reference number and referring to the numeric dictionary with the result. More specific topics are found by using the declension pointer to enter the declension list, then picking the numbers there found until a zero switch is encountered which indicates the end of related headings at this logical level. Searching by and for subject is not unlike that described for title and bears no further discourse. You may by now have perceived that the alphabetic dictionary and the subject index stand in the same order and might well have been combined. In fact, the distinction is purely illustrative and a single file is indeed contemplated. The file concepts presented herein show this method of indexing to be

ACCESSION FILE

	ACCESSION NUMBER	FIRST TITLE THIS BOOK	FIRST SUBJCT THIS BOOK	FIRST AUTHOR THIS BOOK	OTHER AUTHOR THIS BOOK	AUTHOR LEVEL	NEXT BOOK THIS AUTHOR
1	CONTROL	6	6	7	8	8	19
2	B-1	2	2	1	3	1	0
3	B-1	2	2	3	1	2	7
4	B-3	4	5	2	2	0	0
5	B-4	3	4	4	4	0	0
6	B-2	1	1	5	5	0	0
7	BOOK B-5	2	2	3	3	0	0

TITLE FILE

	TITLE	FIRST CHAIN RECORD PTR
1	BURKE'S ANATOMY	1
2	FRACTURES	2
	WINNER	
3	MOUTH REPAIR	3
4	ORTHOPEDIC PRACTICE	4
5	SKIING INJURIES	6
	WINNER	
6	JONES EXAMINES PROTRACTED FIXATION OF COMINUTED SHAFT	7
	WINNER	

TITLE CHAIN

	ACCESSION POINTER	NEXT BOOK THIS TITLE	OTHER TITLE THIS BOOK
1	6	0	1
2	2	5	2
	NO		
3	5	0	3
4	4	0	4
5	7	0	5
	YES		
6	7	0	6
	YES		
7	7	0	2
	YES		END

Fig. 6. Retrieve all the titles for a given book. Given: 'B-5'. Found: 'fractures, skiing injuries,' abstract.

enormously flexible, disarmingly simple, and, the authors believe, replete with potential. The greater the number of monographs cataloged, the greater the probability of additional use of each term or string of text which still occurs only a fixed number of times, thus enhancing the basic file efficiency. It is also apparent that through the chain concept a virtually infinite number of tracings may be indexed to a given work, while the system retains the intrinsic machine economy of the fixed length record. In short, the file structure seems eminently suited for the small to medium-sized library for which it was developed.

illustration

In a typical *author search*, the name of the author is presented, last name first followed by first and middle names or initials. The name is stripped to surname only and passed through the author index using the surname as the key. The result of this search is a record containing the given surname and a pointer to the author file. The pointer to the author file is now used to fetch the appropriate record in the relative author file. The resulting record contains an author's full name, a pointer to another record in this file relating to another person with the same surname, and a pointer to the cross-reference, or accession file. At this time the full name just acquired is compared to the given author's full name. If an unequal comparison results, the pointer to another name in this file having the same surname is used to fetch another record and the name test is repeated. This sequence is repeated until a positive comparison is made or the pointer to next author returns to zero, at which it becomes apparent that the requested author is not in the file.

When an equal name comparison is detected, the pointer to the accession file is used to fetch the appropriate accession record. The contents of the accession record will permit, through pointers to other files, the acquisition of title, subject, descriptive, and miscellaneous information concerning a book by the given author. The last pointer in the accession record points to an additional record in the accession file pertaining to another book written by the given author. This pointer is used to chain down the accession file obtaining all citations for the given author. This can be repeated until the pointer to the next book becomes zero.

Each time an accession record is fetched, seven pointers are obtained to access other files. These pointers are: 1. Accession number (the key or pointer to the file containing descriptive and miscellaneous information). 2. Pointer to title file. 3. Pointer to subject file. 4. Pointer to author file (not used when entering via an author search). 5. Pointer to a joint author. 6. Author level (indicates that this author is either the main author or a joint author). 7. Pointer to the next book by this author.

Using item 2 above to access a record in the title file effects a record containing a title and a pointer to the title chain. The title just obtained is a title of the book by a given author. It must now be determined if another title exists. Using the pointer to title chain, obtained in the title file record, to acquire a title chain record emits a pointer to another title for this book. If this pointer is the same as the title file record number previously obtained, no other title exists for this book. Otherwise, the pointer to the other title is used to access another record in the title file and the above pro-

ACCESSION FILE

	ACCESSION NUMBER	FIRST TITLE THIS BOOK	FIRST SUBJCT THIS BOOK	FIRST AUTHOR THIS BOOK	OTHER AUTHOR THIS BOOK	AUTHOR LEVEL	NEXT BOOK THIS AUTHOR
1	CONTROL	6	6	7	8	8	19
2	B-1 WINNER	2	2	1	3	1	0
3	B-1	2	2	3	1	2	7
4	B-3	4	5	2	2	0	0
5	B-4	3	4	4	4	0	0
6	B-2	1	1	5	5	0	0
7	B-5 WINNER	2	2	3	3	0	0

SUBJECT INDEX

SUBJECT	POINTER TO SUBJCT FILE
ANATOMY	1
SUBJECT	
BONES	2
FIXATION	7
ORAL SURGERY	4
ORTHOPEDICS	5
SPECIALTIES	6
SURGERY	3

SUBJECT FILE

	SUBJECT	FIRST CHAIN RECORD PTR
1	ANATOMY	1
2	BONES	3
3	SURGERY	4
4	ORAL SURGERY	7
5	ORTHOPEDICS	8
6	SPECIALTIES	10
7	FIXATION	15

SUBJECT CHAIN

	ACCESSION NUMBER	NEXT BOOK THIS SUBJCT	OTHER SUBJCT THIS BOOK
1	6	2	1
2	2	14	5
3	2	13	3
		MORE	
4	2	5	6
5	5	6	4
6	4	17	5
7	5	0	6
8	2	9	3
9	4	16	6
10	2	11	1
11	4	12	3
12	5	18	3
13	7	0	1
		END	
14	7	0	7
15	7	0	5
16	7	0	3
17	7	0	6
18	7	0	2

Fig. 7. Retreive all the books for a given subject. Given: 'Bones'. Found; 'B-1, B-5'.

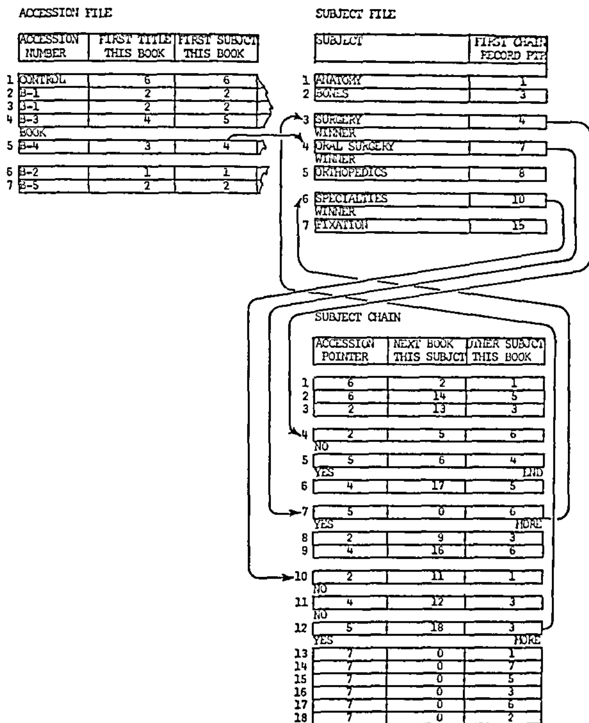


Fig. 8. Retrieve all the subjects for a given book. Given: 'B-4'. Found: 'oral surgery, surgery, specialties'.

ALPHABETIC DICTIONARY

SUBJECT	NUMBER	NUMBER
ANATOMY	A2.0.0.0	
BONES	A2.2.0.0	
FIXATION	E4.5.2.0	G2.2.6.3
ORAL SURGERY	E4.8.0.0	G2.2.9.0
SUBJECT	0	0
ORTHOPEDICS	E4.5.0.0	G2.2.6.0
SPECIALTIES	G2.0.0.0	
SURGERY	E4.0.0.0	G2.2.0.0

NUMERIC DICTIONARY

NUMBER	SUBJECT	DECLENSION POINTER
A2.0.0.0	ANATOMY	1
A2.2.0.0	BONES	0
E4.0.0.0	SURGERY	2
	WINNER	
E4.5.0.0	ORTHOPEDICS	4
E4.5.2.0	FIXATION	0
E4.8.0.0	ORAL SURGERY	0
G2.0.0.0	SPECIALTIES	5
G2.2.0.0	SURGERY	6
	DUPLICATE	
G2.2.6.0	ORTHOPEDICS	8
G2.2.6.3	FIXATION	0
G2.2.9.0	ORAL SURGERY	0

Fig. 9. Find next more general headings. Given: 'orthopedics'. Found: 'surgery'.

ALPHABETIC DICTIONARY

SUBJECT	NUMBER	NUMBER
ANATOMY	A2.0.0.0	
BONES	A2.2.0.0	
FIXATION	E4.5.2.0	G2.2.6.3
ORAL SURGERY	E4.8.0.0	G2.2.9.0
ORTHOPEDICS	E4.5.0.0	G2.2.6.0
SPECIALTIES	G2.0.0.0	
SUBJECT		
SURGERY	E4.0.0.0	G2.2.0.0

NUMERIC DICTIONARY

NUMBER	SUBJECT	DECLENSION POINTER
A2.0.0.0	ANATOMY	1
A2.2.0.0	BONES	0
E4.0.0.0	SURGERY	2
E4.5.0.0	ORTHOPEDICS WINNER	4
E4.5.2.0	FIXATION	0
E4.8.0.0	ORAL SURGERY WINNER	0
G2.0.0.0	SPECIALTIES	5
G2.2.0.0	SURGERY	6
G2.2.6.0	ORTHOPEDICS DUPLICATE	8
G2.2.6.3	FIXATION	0
G2.2.9.0	ORAL SURGERY DUPLICATE	0

DECLENSION LIST

	NUMBER	INDICATOR
1	A2.2.0.0	0
2	E4.5.0.0	1 MORE
3	E4.8.0.0	0 END
4	E4.5.2.0	0
5	G2.2.0.0	0
6	G2.2.6.0	1 MORE
7	G2.2.9.0	0 END
8	G2.2.6.3	0

Fig. 10. Find next more specific headings. Given: 'surgery'. Found: 'orthopedics, oral surgery'.

cedure is repeated until all titles have been detected. Item 3, used in conjunction with the subject file and subject chain, will ultimately bring forth all subjects associated with the given book.

conclusion

We have presented a logic of search in an automated library catalog utilizing a file structure based upon index-sequential and relative files. The files presented provide a measure of machine economy and the ability to access, with a minimum of search time, the bibliographic information for books and monographs in a medium-sized library.

ALPHABETIC DICTIONARY

SUBJECT	NUMBER	NUMBER
ANATOMY	A2.0.0.0	
BONES	A2.2.0.0	
FIXATION	E4.5.2.0	G2.2.6.3
ORAL SURGERY	E4.8.0.0	G2.2.9.0
SUBJECT	0	0
ORTHOPEDICS	E4.5.0.0	G2.2.6.0
SPECIALTIES	G2.0.0.0	
SURGERY	E4.0.0.0	G2.2.0.0

NUMERIC DICTIONARY

NUMBER	SUBJECT	DECLENSION POINTER
A2.0.0.0	ANATOMY	1
A2.2.0.0	BONES	0
E4.0.0.0	SURGERY	2
	WINNER	
E4.5.0.0	ORTHOPEDICS	4
E4.5.2.0	FIXATION	0
E4.8.0.0	ORAL SURGERY	0
G2.0.0.0	SPECIALTIES	5
G2.2.0.0	SURGERY	6
	DUPLICATE	
G2.2.6.0	ORTHOPEDICS	8
G2.2.6.3	FIXATION	0
G2.2.9.0	ORAL SURGERY	0

Fig. 9. Find next more general headings. Given: 'orthopedics'. Found: 'surgery'.

ALPHABETIC DICTIONARY

SUBJECT	NUMBER	NUMBER
ANATOMY	A2.0.0.0	
BONES	A2.2.0.0	
FIXATION	E4.5.2.0	G2.2.6.3
ORAL SURGERY	E4.8.0.0	G2.2.9.0
ORTHOPEDICS	E4.5.0.0	G2.2.6.0
SPECIALTIES	G2.0.0.0	
SUBJECT		
SURGERY	E4.0.0.0	G2.2.0.0

NUMERIC DICTIONARY

NUMBER	SUBJECT	DECLENSION POINTER
A2.0.0.0	ANATOMY	1
A2.2.0.0	BONES	0
E4.0.0.0	SURGERY	2
E4.5.0.0	ORTHOPEDICS WINNER	4
E4.5.2.0	FIXATION	0
E4.8.0.0	ORAL SURGERY WINNER	0
G2.0.0.0	SPECIALTIES	5
G2.2.0.0	SURGERY	6
G2.2.6.0	ORTHOPEDICS DUPLICATE	8
G2.2.6.3	FIXATION	0
G2.2.9.0	ORAL SURGERY DUPLICATE	0

DECLENSION LIST

	NUMBER	INDICATOR
1	A2.2.0.0	0
2	E4.5.0.0	1 MORE
3	E4.8.0.0	0 END
4	E4.5.2.0	0
5	G2.2.0.0	0
6	G2.2.6.0	1 MORE
7	G2.2.9.0	0 END
8	G2.2.6.3	0

Fig. 10. Find next more specific headings. Given: 'surgery'. Found: 'orthopedics, oral surgery'.

cedure is repeated until all titles have been detected. Item 3, used in conjunction with the subject file and subject chain, will ultimately bring forth all subjects associated with the given book.

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We have presented a logic of search in an automated library catalog utilizing a file structure based upon index-sequential and relative files. The files presented provide a measure of machine economy and the ability to access, with a minimum of search time, the bibliographic information for books and monographs in a medium-sized library.

3

information storage and retrieval

the medical librarian's role in information transfer

C.W. Sargent

For the past few years much time and funds have been expended on building large storehouses of information and systems to retrieve that information. This phenomenon has been encouraged and abetted by a generous U.S. government under various laws for these specific purposes. Such legislation has given rise to buildings to house the collections, training programs to prepare librarians and information specialists/scientists, and grants to enrich library collections and improve services as well as to permit some research into the problems which beset libraries and information centers in the purveyance of their basic product, information.

This has all been necessary, and the measure of success cannot be accurately assessed now as all the data are not in and, in fact, may never be as the proliferation of new programs makes it almost impossible to synthesize all the accumulated information, both collected and projected. Price (1961) pointed out the problem in at least one phase — scientific and technical journals — in his book *Science since Babylon.* He showed that by the year 2000 the projected population of scientific journals would reach 1,000,000 — all this explosion from the first scientific journal's appearance in 1665. Mr. Price asked the question then, still not answered: given this exponential growth and in the face of the present crises in information centers, will the resort to computers be more than a palliative answer?

This research has given rise to a number of systems, the most publicized being MEDLARS, which attempt to capture biomedical information in such a manner as to be able to digest it and spew it out at some future time. Elaborate schemes have been devised to structure thesaurus languages, seeking the best way to control this vast amount of information. Most of these thesauri have had a modicum of success in their own specialized areas. The failures we do not care to talk about, and the theories that have failed upon application are best forgotten. Nonetheless, many honest efforts have been and are being made to come to grips with the problems. Most of these systems are honestly reported, and the reports all show some measure of success if the system has been rigidly constructed and applied by the initiated. This is not to say that the systems are inherently at fault, because the information stored away in these systems is not finding its way to the physician which should result in better medical care for the population at large.

A new phenomenon in medical librarianship has appeared on the horizon in the past few years, the regional medical library and the medical library network. The passage of P.L.90-456, August 3, 1968, in the U.S. Congress creating the Lister Hill National Center is but the latest manifestation of the concern of many for the provision of some mechanism for providing improved informational and educational services to the medical community. Its passage reflects recommendations of both the President's Commission on Heart Disease, Cancer and Stroke (1964) and the Report of the Special Committee on Investigation of the Department of Health, Education and Welfare (H.R. 2266) of 1966. The design of this network is predicated on the tenet

that educational processes must be coupled with information resources to facilitate the development of new knowledge, to speed the flow of new knowledge to application and thus improve medical care to the sick and disabled, to improve health services delivery, to improve the teaching of medical students, and to improve the understanding of the public with respect to preventive medicine. I find it somewhat significant that no professionally trained medical librarian was invited to the meeting held at the National Library of Medicine in December 1968. There were, no doubt, good and valid reasons for this. Possibly it was that the final recipient of all that information which had been assembled by librarians has been less than enthusiastic with the role that the librarian has played in information transfer.

In spite of the large amounts of time, people, and funds which have been expended, there still remains the fact that there is no valid proof that medical care has noticeably improved. Any improvement in medical care has come about because of other factors, not the least of which has been government aid to low income groups for health care. As information handlers we have continued to neglect, if not ignore, the information needs of the clinician, the man who makes up the bulk of those practicing the medical sciences. It appears as though most systems are aimed at the researcher or the teacher. Little or no attempt has been made to assess the physician's (practicing alone or in a group) information needs. We know that the communication of any knowledge has a degree of success based on many variables. It would seem, therefore, that the needs of the practicing physician should be assessed and be of paramount importance before designing any information system. It would be inconceivable that General Motors would attempt a new automobile without first surveying the possible market. A recent example of either no or very little surveying was the financial fiasco of the Edsel. Almost every system has been designed with the belief that the collector of information is best qualified to determine what information will be sought somewhere down the road. Most of these systems become eolithisms. An eolithism has been defined by Dr. David Hawkins of the University of Colorado as a piece of junk, like a spear, accidentally adapted to a use which is suggested by its form. This can be contrasted to a designed creation brought into being to subserve some reasonable service. I suggest that many existing systems are eolithisms. Because of this predication, many systems have either failed or are not achieving their maximum effort.

It is highly probable that the clinician's information needs can be assessed. We in the University of Missouri School of Medicine's Computer Program are working on such a proposal. It is visualized that the method could be as crude as donning a white coat and following the physician on his rounds in the hospital or in his office. Why not? Why has the medical librarian/information scientist not been included in the list of paramedical personnel? At a recent Medical Manpower Conference held at our University, it was significant to me that the medical librarian was not listed as a member of the medical team which needed to be recruited and trained, but the medical records librarian was. This most certainly should say something to us if our exclusion from national network planning does not. This may appear to be a parochial viewpoint, but I believe it should merit some consideration by the profession.

The clinician may ask for information in a variety of ways, and most of them are

not easily captured. Most physicians in the U.S A. have more patients than they can adequately handle. Ask any patient who has had a one o'clock appointment and eventually saw the doctor at three. The busy physician will not always take the time, in most cases, to go to a library, assuming that an adequate one is nearby, to read up on a given subject. Even if he would, he might not find the latest information due to the time lag between submission and publication of any given article. Failing to receive ready answers to his information needs, the physician is forced to fall back on his own resources, often inadequate, with resultant poor medical care. It would appear that some method should be devised which would be economical, efficient and quick, if the physician is going to use it. The one device available to everyone is the telephone. We propose to use this instrument as a primary tool to retrieve information as well as to input information into a system.

Missouri already has one mechanism in operation which we call the Audio Message Center, with a planned future capacity of 5,000 messages on various subjects ascertained to be of significance not only to the researcher and the student, but also to the practitioner. This system was based on the Wisconsin program under the direction of Dr. Thomas Meyer (1969), with the difference that our system is entirely automated. Anyone who has the telephone number of the message he desires can call at any time and listen to that message This Center is also used by the multidisciplinary laboratories in the School of Medicine by means of extension telephones so that a number of students can listen to the same message concurrently. Voice amplifiers could be used for larger groups who are interested in the same message. Currently, the physician can call from anywhere in the State of Missouri and, in fact, from anywhere in the world. A WATS line would be installed for the use by the Missouri physician.

In addition to being able to call in for information, the physician can record information over the telephone which he would like to impart to his colleagues, eliminating memoranda and separate mailings. Naturally, the fidelity of recording would not be as good as those messages which have been taped in a studio, but in this case, the information would be the important consideration. If his information were of a nature to be of permanent importance, he could be invited to a recording session at a later date which would be convenient for him. He could use the system to record his requests for information; periodic checking of this tape by the information staff would make these requests for information part of the assessment data and fill them as quickly as possible. He could also call direct and explain his needs to a trained medical librarian who would then help him in a variety of ways. One of these aids could be the Audio Message Center.

The University of Missouri has been working for some time on the Audio Message Center and has planned its development in 4 phases. Phase One consists of 3 incoming extension lines from the Medical Center's switchboard which can access a total of 40 messages. These messages can be produced on a low volume device such as the Roberts Recorder. It was recognized that the quality of the recordings must be sacrificed for expediency. This phase has been completed. Phase Two consists of 500 messages, all of which are accessed through direct dialing. Equipment was purchased to create a high fidelity submaster which made it possible to dub onto a cartridge with 8-track quarter-inch tape. The equipment to access the messages was installed by

the telephone company early in December although the benchmark date was September 30.

The basic component of the Message Center is a slight modification of the 8-track stereo tape decks which are installed in automobiles. These are inexpensive, mass-produced, and are really quite good. The messages are recorded individually on the 8 tracks and the read heads can advance to the specific track on command from the telephone switching apparatus. Thus there are 8 separate messages for 1 cartridge.

The schedule called for increasing the Message Center's capacity by increments of 100 by the end of January 1969 with 300 messages to be installed by the latter part of March and another 300 by July. This would make a total of 1,200 messages and would complete Phase Three. Phase Three would entail expanding the present switching circuits and also adding more recorders. Access of the additional messages would be the same as in Phase Two. It is hoped that an experimental touch-tone telephone dial system would be incorporated at this time.

Phase Four would replace the entire telephone switching system with a computer-controlled switching system. This would allow branching from one message to another as well as random access to many messages. In addition, it would allow for automating certain bookkeeping chores, such as who called, what time of day he called, and statistical studies on the system's usage. This phase of the program will be completely controlled by a touch-tone telephone system which should be available by this time.

An extension of the service already being given is an association with the Missouri Regional Medical Program, which will use the services of the Audio Message Center to mount a project to provide consultative messages tailored for the Missouri general practitioner. This project will progress from a 3- to 6-month evaluation survey of specific areas of the State to the production of tapes with subjects suggested by these physicians. The result could very well be a multifaceted matrix which would reflect the interests of various parts of the State, of local medical societies and teaching institutions.

The University of Missouri has been working on other information storage and retrieval systems which make it easier to transfer information to the physician. One of these systems is the Fact Bank, which stores information on various subjects in medical science. This system will not only retrieve citations to the literature but also microfiche copies of the cited article. The Fact Bank, which is computer-oriented, can give rapid replies to requests for specific facts as well as to compile bibliographies on specific subjects. The Fact Bank can work in close harmony with the Message Center, and, in fact, is an extension of it.

Another program which is under development is one which is called Expanded Consider. This has been conceived more as a teaching device than as an information storage and retrieval system. However, used in conjunction with the Audio Message Center and the Fact Bank, it takes on the qualities of an information imparting system. Expanded Consider's data base is the AMA's *Current Medical Terminology* (Gordon, 1966). The user can input certain symptoms and receive a number of possible diseases which are described by those symptoms. If he wishes more information, he can type in the word 'expand' and the computer will display on the cathode ray tube

(IBM-2260) citations to the literature as well as more information on any one of the diseases which had been previously selected; thus the term 'Expanded Consider'. This program has been designed as a general purpose system, and has broader applications to the library control of information.

Still another system being developed is the automatic ECG. Using a data chart and the regular telephone lines, remote ECG's can be taken, transmitted to the IBM-360 computer in the Medical Center, and a diagnosis which has been converted from analog to digital be made and transmitted back to the physician making the ECG via teletype. This report not only includes a diagnosis of the ECG but also includes an Audio Message Center number. If the physician taking the ECG wishes more diagnostic information, he can call the Message Center and receive any one of 150 messages keyed to that many possible diagnoses. These diagnoses have been written by an expert in the field and recorded by the staff.

These are only systems to make it easier for the physician to obtain information. They may well prove eolithic in concept. The main purpose of the current proposal is to ascertain what categories of information the doctor is going to ask for. If this were known, it would then be possible to build the various systems and store the information in a more scientific way than is presently being done. The medical librarian should be early and vitally involved in such a program. He is uniquely trained to evaluate such data as probably no one else. He should no longer be merely a purveyor of information, as his involvement in this kind of an endeavor makes him an evaluator as well.

Many of us have congratulated ourselves on having been clever enough, or having had some foresight (often hindsight) to obtain some piece of information, stockpiling it against the day when it would be requested. This has been haphazard planning at best. How much better to have clearly defined some guidelines from the man whose daily contacts with the patient makes him the best source of this information? Maybe this cannot ever be done to the complete satisfaction of all concerned, but it seems a more viable system and more easily defended than the many systems, both manual and mechanized, that have either failed outright or are doing only an 'adequate' job, never reaching their potential.

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II

source organization of biomedical information

P. Cignolini and M. Valenti

A system for the organization of biomedical information is to be considered similar to those providing for the treatment of information in other scientific areas. However, it is not with the system as a whole that we are mainly concerned in this paper, but with that peculiar aspect of it which may be defined as the 'source organization' of information.

As to the system as a whole, we share the opinion that fundamental steps towards the goal have been made by the creation of MEDLARS and, most recently, of the Excerpta Medica biomedical information program. With the aid of computers, biomedical scientists will soon have access to systems which will enable them to receive information from many sources throughout the world. However, computers give back what they have received from humans, and abstracting/indexing remains costly. Moreover, it involves heavy responsibilities as to the selection of actually useful materials, *i.e.*, of materials conveying information either conceptually or methodologically new.

It might be considered a commonplace to say that abstracting/indexing, especially if selective, is one of the bottlenecks in the flow of information. But the problem does exist, and with particular evidence in the biomedical sciences, where for the ever increasing production of periodicals, conference proceedings, monographs, papers, etc., there is a corresponding high percentage of second-rate or poor material, which adds to the costs and lowers the qualitative effectiveness of any information system.

A second problem which faces any biomedical information system is that of catering for the needs of those users who require a more limited, less sophisticated level of service. By that we mean the millions of readers of biomedical journals, such as practising physicians or other professional people, whose requirements only exceptionally exceed what could be called a 'partial' information, as contrasted to the 'total' information requested by a minority of biomedical scientists. In particular, we assume that 'partial' information is that contained in a private collection or in a very small library: some dozens of periodicals, which are only a fraction of the universe of information, immediately available to the user without referring to an external system.

Some data referring to the year 1965 will be significant as to the dimension of the body of users of the two types of information. In that year the bibliographic searches carried out by means of MEDLARS were about 5,000, with a cost ranging from $60 to $150 per search (according to the length of the period covered) for a total of $300,000; similar data are furnished by the MEDLARS centres more recently established in Great Britain and Sweden (OECD, 1967). On the other hand, we have a total of about 3,000 biomedical periodicals published in the world and, for one of the leading titles among them, *JAMA*, the number of subscribers was 220,000 in the year 1965. An estimate of about one million subscribers to, and several millions of readers of, biomedical journals is therefore to be considered as a realistic dimension for 'partial' information users.

It is a well-known fact that both kinds of biomedical information have reached a crisis and that a powerful tool for the solution of this problem might be the co-operation of producers (authors, editors, publishers) towards a standardized presentation and memorization of information. In such a process, the determining role of publishers cannot be underestimated, and the first step to be taken is to discuss the question with them, with particular reference to the formulation of international agreements and to the adoption of an operational program. Initiatives have not been lacking to that purpose, both at international and national levels, and we think that a special mention of the problem should also be made in the conclusions of this Congress.

In accordance with the opinion of experts throughout the world and, more specifically, with the UNESCO (1968) and ISO recommendations concerning scientific publications, a project of source organization of biomedical information may be summarized as follows: papers to be published in periodicals will be accompanied by informative *abstracts* and by *descriptors* (and/or classification codes) sufficient to identify the contents; *titles* of papers will be concise but as informative as possible; issues of periodicals will contain *standard bibliographical cards* (or strips) for the papers published in them; cards (or strips) will carry full bibliographic references, informative abstracts (both in the original language and in English), and the list of descriptors (and/or classification codes) Another step, to be taken in connection with a favourable reaction of users, could be the production of periodicals in two versions: the traditional one and a new format with single papers printed and kept as separate units.

This programme, while contributing to the improvement of information conveyed by biomedical publications, would aid considerably in reducing the cost of its treatment by automated systems. To the users of 'partial' information, this program would offer rational tools for manual filing and, in the case of periodicals received as sets of separate units, the opportunity of forming subject collections of great flexibility according to specific needs. This last advantage, together with the complete availability of material at all times, cannot be underestimated, especially when considering that a chronic shortage of time is typical for this category of users.

Source organization of biomedical information will undoubtedly cause some difficulty or financial inconvenience for publishing houses, which, on the other hand, are likely to record a slow but continuous increase in the number of subscriptions. In addition, we feel that publishers are becoming increasingly aware of the possibilities of a larger contribution to the progress of biomedical knowledge.

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III

non-electronic information retrieval

A.J. Harley

I would like to begin by saying how pleased I am to be asked to come to Amsterdam and speak about non-electronic information retrieval. It is a kind of vacation for me, because my ordinary daily work is almost entirely concerned with information retrieval by computer. However, although I am sure, from my experience of MEDLARS, that computer retrieval is useful, and will become more so, one has to admit that it still accounts for quite a small proportion of the bibliographic references retrieved. I believe that ordinary abstracts and indexes will be with us for many years.

In the rest of what I have to say, I am going to use the single short English word 'guide' to mean abstracting and indexing periodicals, or other bibliographic tools which are printed and used in the library as a means of discovering published scientific or technical papers.

When he invited me to come, the secretary asked me to discuss the phenomenal proliferation and fragmentation of bibliographic tools, and to speculate on the implications for library collections. I think the answer to this problem can be stated in a single sentence: the librarian must collect first those guides most useful to his readers, and then the next and the next, as far as resources allow. The really interesting problem is this: how is the librarian to find out the relative usefulness of the bibliographic tools he might buy?

I am assuming, of course, that the modern medical librarian is a professional, offering a highly skilled service, rather than a mere janitor of books. Giving a professional service of this kind implies interacting with your clients, educating them, and discovering their real needs. This requirement for interaction becomes more acute as the guides to the literature proliferate and grow more difficult to use.

Having loaded the librarian with a responsibility for being a tutor to his users, I am going to add another task: that of making librarianship more of a science and less of an art. This is because I believe that the librarian must bring to bear an analytical approach and a respect for quantitative data. Only in this way will he solve his problem about choosing guides to the literature. Incidentally, his scientific clients will probably be more sympathetic to this approach, too.

First, let us make sure there is a problem. I will tell you why I think that ordinary manual guides to the literature will be useful for a long time. We know a lot about the present situation from surveys we have done at the National Lending Library in England. The main function of this library is to collect the world's scientific, technical, and social scientific literature, and provide a rapid loan and photocopy service to other libraries. At peak times, we process 20,000 requests a week, mostly by return of post. We have reason to believe that the pattern of borrowing from us is a good reflection of the use of the literature as a whole by scientists. For example, the most frequently borrowed journals are such titles as *Nature* or the *JAMA*. We therefore think that, when we examine our loan requests, we have a fair sample of the use of the literature as a whole.

About a year ago, we sent out questionnaires to scientists who had requested

medical literature from us, asking them where they had learned of the references they were trying to borrow (Wood and Bower, 1969). We analysed about 2,600 replies, and found that nearly half the references had been obtained from the bibliographies of other papers or books. About 40% were the fruits of information retrieval, and of these, nearly ten times as many were found by manual methods as by computer retrieval.

It is true that MEDLARS has not yet reached its full potential. We processed about 2,200 demand searches in 1968, and, extrapolating the growth curve, we expect about 3,200 in 1969. That might be about half the worthwhile questions lying around, waiting to be put to the system. Computer retrieval will undoubtedly grow further, but the main limiting factor will be the economics of computing. If, for example, your library user wants 'the best recent papers on heart valve surgery', it will be a long time before a computer can give the answer more cheaply than *Index Medicus*.

Let us turn now to the problem of the proliferation of manual guides to the literature. At the NLL we attempt to collect all abstracting and indexing periodicals, and we publish a KWIC index of the English-language ones. This is the most up-to-date list I know of. It contains about 200 which might be said to concern medicine, although I have not included in the 200 many guides, such as *Chemical Abstracts*, which are sometimes very useful to medical scientists. Among the 200 are about 60 which are principally primary journals, but which have a section of abstracts of current literature. We can discount these, because I think that they should be bought on their merit as primary journals. Few of them are very useful for retrospective retrieval.

Among the real guides are a few large comprehensive ones, such as *Index Medicus*, *Excerpta Medica*, and *Meditsinskiĭ Referativnyĭ Zhurnal*, and a great many small ones. The latter may select their material by subject, *e.g.*, *Leukemia Abstracts*, or by country of origin, or 'quality' or some more haphazard criterion.

How is the librarian to choose? One factor, of course, is price. *Science Citation Index* is an extremely useful tool, but it costs about 25 times as much as *Index Medicus*. Is it 25 times as useful? I believe that we should all look at this idea of 'usefulness' as analytically and as quantitatively as we can. First of all, it breaks down into three main components. I will call them 'speed', 'coverage', and 'usability'.

By 'speed', I mean a measure of the time which elapses between the public availability of documents and their appearance in the index of the guide concerned. Notice that I say 'the index'. Appearance of an abstract without an index to retrieve it by is obviously much less useful.

By 'coverage', I mean a measure of thoroughness and subject. A simple operational definition might be to say that if there are x documents relevant to a given reader or group of readers, and y of these appear in the guide, then its coverage is $\frac{y}{x}$. In practice, when it actually comes to measuring this quality, we shall have to be content with an approximation.

By 'usability', I mean a group of related qualities which affect the ease, or difficulty and frustration, of using the guide. There is the 'thumb factor', in which we consider the amount of volume heaving and page turning which has to be undertaken; there is the 'imagination factor', which is a matter of how easy it is to understand the

classification or the index language-personally, I think this to be the most important of all. There is the 'eyeball factor', which is a measure of how much print the user must scan when he has found the right place to start; and there is the 'information factor', which is a measure of the certainty of recognizing that a paper is relevant, according to the amount of information given about the content of the paper. For example, a guide which gives the title only, such as *Index Medicus*, has an inherently poorer information factor than one which gives abstracts. Let us examine each of these in more detail.

Speed is simple to understand, and fairly simple to measure. Here is an elementary test for comparing two guides. Take the June 1968 issue of each, and select a random sample of a hundred references from each. Count the numbers of references which have publication dates given as 1968, 1967, 1966, and earlier, and compare the distributions for the two. A more refined method involves repeating this exercise for, say, the February, April, June, August, October, and December issues of each guide, plotting the results as a histogram for each guide, and comparing the two histograms. We find, for example, that significant numbers of 1968 papers appear in the April issue of *Index Medicus*, whereas they do not start appearing in *Biological Abstracts* until June, and in *Excerpta Medica* until August. However, the 1968 issues of *EM* contain very few pre-1967 papers, whereas the other two both contain significant numbers, forming a long tail to the distribution.

I must point out that, when interpreting results like these, one needs to consider them in the light of coverage, too. In particular, it is worth examining a long tail to find out whether the material in it is covered at all by the other guide we are comparing it with. It is also worth saying that this is a crude test which will only show up gross differences. This is quite adequate for administrative purposes. If the speed of two guides is similar, the decision which to buy will rest on other criteria. If a one-month difference in speed is going to be really important to your readers, it will be necessary to devise a more accurate test.

To measure or compare *coverage* is not so simple. If the librarian were considering only the needs of a single, well-established research team, he might ask them for a sample of references which they considered of the greatest importance. He would then check these references in the guides which were candidates for selection for the library, and see what proportion of them could be found in each. Martyn (1967) has tried doing this by taking the bibliography of some standard work, and checking the references in various guides to the literature.

An alternative method of comparing two guides is to take a sample of references from each, and check whether they appear in the other. In guides with a wide subject field, samples can be drawn from specific subject subdivisions to obtain a more detailed comparison. Notice that with this method, if the coverage of both the guides being compared is poor, the results become unreliable.

Finally, let us look at *usability* by taking an example. Suppose that a scientist is working on electroencephalography of humans who are being subjected simultaneously to physical and mental stress, as for example, participants in sport. Obviously, telemetry methods will come into the actual measurements, and this is the aspect about which he is searching for papers at present. Thus he is looking for references

which embody the three concepts of EEG, telemetry, and sport or similar activity. We will assume that he will make his search in March 1969, on guides to the literature published in 1967 and 1968. As an example of a paper which fits his requirements exactly, there is 'Telemetered EEG from a football player in action' by Hughes and Hendrix (1968). More peripheral, but possibly of sufficient interest for him to obtain the full text, is 'A three-channel EEG telemetry system for large animals' (West and Merrick, 1966).

Our hypothetical scientist sets forth hopefully to carry out a literature search in his library, intending to look first at *Index Medicus*, *EM* and *BA*. In *EM* he will have to look in at least two sections (*Physiology* and *Neurology*). (I assume that you are all familiar with the indexes of these three guides.)

Let us look first at the *imagination factor*. Two of the concepts he is searching for are clearly defined, 'electroencephalography' and 'telemetry'. The other one, 'sport' or 'exertion and stress', is more difficult. *Index Medicus* has headings for the first two, *EM* has **EEG** and **Telemetry** in 1967, with the addition of a single heading **EEG Telemetry** in 1968. The KWIC index of *BA*, of course, uses uncontrolled vocabulary, but all the words beginning **Telemet-** come together, and, provided one looks at both **EEG** and **Electroencephalogr-**, it is not too difficult.

When it comes to the 'sport' concept, the virtues of the published MeSH for *Index Medicus* become very apparent. It says plainly that there is a term **Sports**, with half a dozen more specific terms, such as **Boxing**, **Mountaineering**, **Swimming**, etc. There is no term **Football**, but it is clear that papers on football should be indexed **Sports**. In *EM*, the paper by Hughes and Hendrix was indexed **Football**. This implies that, if one is to pursue this concept at all in these indexes, one has to imagine every possible sport name, and check each one in every part of the index, for its absence from one issue does not imply that it will not appear in another. In *BA*, the situation is similar, except that control of the index language is still less. In practice it is hardly worth looking under the sport concept in the latter two, although the consequences of ignoring it are apt to be more serious in *BA*.

In *EM* and *BA* the information transfer process is broken into two stages, one at the index and one at the abstract. In *Index Medicus*, all the information is available in one place, but of course it consists of the title only, plus the implication of the heading you have found it under. Hughes and Hendrix have given a good title, but quite a high proportion of the titles in *Index Medicus* do not carry all the main concepts which occur in the paper (Harley, 1968). It follows that, to compensate for this, one has to look in all the possible places in *Index Medicus*, including the sport headings, just in case someone has entitled a paper 'Effects of speed and difficulty on EEG'. This is a very interesting find under **Skiing**, but would probably be ignored under **Electroencephalography**. Incidentally, the Hughes and Hendrix paper was not listed in *Index Medicus* under **Telemetry**, although it has it on the MEDLARS tapes.

The new-style *EM* indexes are very interesting, because they offer the possibility of co-ordinating headings together. Thus, one can look under **EEG** for papers that have the heading **Telemetry**, and preferably a sport heading as well. If the user is interested in the broader aspects of all EEG telemetry, the sport papers are collected as a subset of them, without further effort. Not only do these *EM* indexes have a high

information content, but the presence of an abstract leads to a more accurate assessment of the likely relevance of a paper. This was shown up in the NLL medical survey (Wood and Bower, 1969).

However, the presence of an abstract does lead to an increase in the *thumb factor*. One has to consider the sheer weight of *Index Medicus* against the large number of single issues of *BA* or *EM* that have to be ploughed through, pending arrival of the annual cumulation. Also, except in *Index Medicus*, whenever an interesting entry is found in the index, more volume lifting and page turning is required to find the abstract.

Lastly, there is the *eyeball factor*. In the 1967 *Cumulative Index Medicus* alone, there are about 600 references listed under **Electroencephalography**. There are a further 40 under **Telemetry**, plus another 185 distributed under the seven **Sports** headings. It is probably about 45 minutes work to scan these thoroughly. In *EM*, the 1967 cumulative index to the *Physiology* section has 226 entries under **EEG**, but it is not necessary to look at all of them. Because of the alphabetic arrangement, one can stop scanning at the point where **Telemetry** would be the second term in the entry. In the 1967 cumulative KWIC index to *BA*, there are 305 entries with keywords beginning **Electroenceph-**, and a further 5 with **EEG**. There are 33 entries with words beginning **Telemet-**.

I certainly do not propose to attempt to recommend one of these guides above the others, and there are some I have not mentioned at all, which should perhaps be consulted in answering my sample question. There are no neat answers, and I cannot give you a formula on which to add up points for and against each guide, until you can rank them in a clear order of merit. This is because the weight which you give to each of my factors will be different in the different circumstances of each library. What I hope I have offered is a mode of thought. This mode of thought should be familiar to your readers, as applied to their own specialities. If you are attempting to educate them on library matters, I think you will find that they respond to an approach of this kind, and it is then a short step to obtaining their co-operation. This last is essential if we are to find out what they really need, and if we are to provide the best possible professional service to them.

Finally, there are some lessons to be learned for those who produce guides to the literature. The kind of thinking I have described gives them a basis for going out and doing some market research on the readers who use (or ignore) their products. What are their frustrations? A year's run of *Index Medicus* weighs about 25 kg. Does this outweigh the advantages of its rigidly controlled terminology? Papers on a given subject may be scattered in two or more sections of *EM*. Should there be an overall index covering all the sections? And for those who produce one of the more specialized guides, what can they offer that the big ones can not?

We have already seen the effects of computer processing on the large scale guides. It offers a flexibility and speed not possible before. There should then be no problem in producing guides exactly suited to the readers' needs. Computer retrieval is useful for the minority of complex literature problems. Ordinary non-electronic retrieval can be cheap and efficient, provided that the users of guides, the producers of guides, and between them the librarians, have a rational approach to their selection and use.

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conventional or modern search procedures in medicine?

H. Fink

Our organization (Farbenfabriken Bayer AG) daily undertakes an average of 20 medical literature searches, of which 16 do not refer to preparations of our own manufacture. All three search paths are available and are taken: via the conventional path, using an enquiry catalogue or other standard search aids; mechanically, using IBM punched cards; electronically, using magnetic tape.

Registration of the search task is followed by a contents analysis, which fixes what is to be sought and culminates in a list of the headings of the search. It is followed by analysis of the requirements, which fixes the scope and the period to be covered by the search. From this a team decides on the search path and the search strategy. The latter is written as a Boolean expression for the mechanical and electronic pathways.

For each search only *one* search procedure is at first chosen. The person responsible for seeing through the search judges whether the information obtained meets the requirements. If it does not give all that is wanted, the team fixes a second or third search with the same search procedure but a different search strategy, or a different search procedure but the same search strategy (Fig. 1).

An organization which is required to work within a reasonable budget cannot afford to accord the same weight to the three search procedures or allow them to compete as in a natural science experiment, but has to gear the procedure to the task. In this way, the machinery of the three procedures is subject to constant adjustment to the wishes of the user. Our present arrangements are as follows:

Enquiry catalogue: the duplicate of the form which is sent for search is classified under the key words.

Other conventional search aids: German and American handbooks, *Index Medicus*, *Bibliography of Medical Reviews*, *Bibliography of the History of Medicine*, *Chemical Abstracts*, some *Excerpta Medica* sections, nearly all major German abstracting and primary journals, CBAC, series, working catalogue of the library, coded file of reviews, author files of work on our products, author files of reprints, reference works, dictionaries, etc.

Punched card files (Fig. 2): 10 contents files of publications for 10 years on our own products; 6 special files of publications for 10 years on important classes of substances (peptides, barbiturates, penicillins, sulphonamides, etc.); 10 special files of work on diseases and symptoms over the last 5 years; 10 special files on accessions of the current year.

Electronic data files: 10 contents data files on the stock of a total of 500,000 publications over 10 years, pre-sorted according to the chemical features of the structural units, metabolic products, diagnostic agents, and therapeutics listed in them.

Which procedures are actually used if these conditions are met? The results of a survey (Table I) in 1968 are surprising. Despite all the enthusiasm for modern documentation methods, despite 10 years pioneering work in this field, and despite the wide possibilities, conventional searches were made in 54% of all searches.

Table I. *Choice of search procedure as a result of the rationalization of the search process.*

Procedure	I Catalogue of enquiries		II Classical searches		III Mechanical searches		IV Electronic searches		Total
One	(I)	223=24%	(II)	239=26%	(III)	261=28%	(IV)	–=0%	723=77.3%
Two	(I+II) (I+III) (I+IV)	43= 5% 55= 6% –= 0%	(II+I) (II+II) (II+IV)	43= 5% 36= 4% 1= 0.1%	(III+I) (III+II) (III+IV)	55= 6% 36= 4% 54= 6%	(IV+I) (IV+II) (IV+III)	–=0% 1=0.1% 54=6%	189= 20.2%
Three	(I+II+III) (I+II+IV) (I+III+IV)	9= 1% –= 0% 11= 1%	(II+I+III) (II+I+IV) (II+III+IV)	9= 1% –= 0% 3= 0.3%	(III+I+II) (III+I+IV) (III+II+IV)	9= 1% 11= 1% 3= 0.3%	(IV+I+II) (IV+I+III) (IV+II+III)	–=0% 11=1% 3=0.3%	23= 2.5%
Σ	(ΣI	341=36%)	(ΣII	331=35%)	(ΣIII	429=46%)	(ΣIV	69=7%	935=100.0%

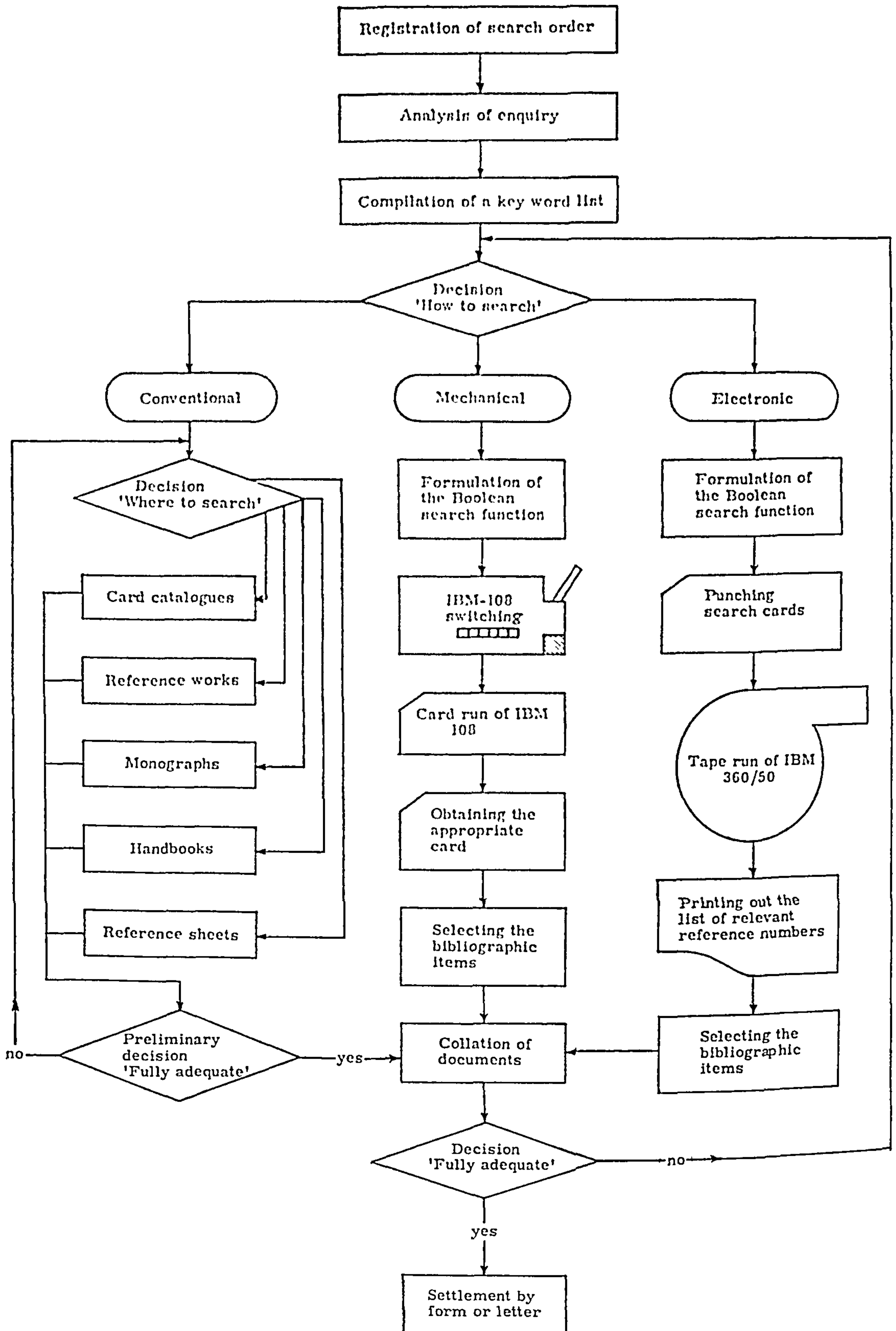


Fig. 1. Literature searching: flow diagram.

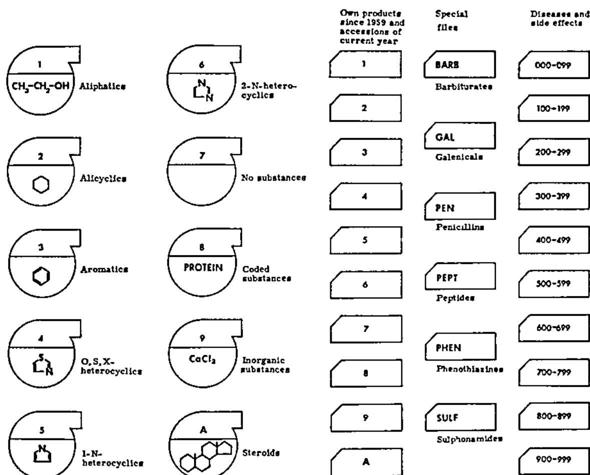


Fig. 2. Literature searching: presorting for *(left)* electronic and *(right)* mechanical retrieval.

In a quarter of the searches, a glance at the current enquiries file was enough to meet the task which was analysed not by a single person but by a team who mutually checked on each other. These were enquiries determined by modern trends in medicine such as transplants, diabetes, myocardial infarct. Every documentation centre shows an increase in such activities arising from modern trends. In another quarter of the cases, standard searches were given precedence. This may be due to one of two reasons: either it is a problem of rare items from which the lay public tend to judge the utility of a documentation system, not realizing that cluttering a documentation system with rare items makes it cumbersome and expensive and leaves it open to human errors; or, often a limited demand contrasts with a flood of information, that is, when a glance at the reference sheet will rapidly turn up 5 appropriate publications, in which case the recipient would be disconcerted if presented with 500 mechanically or electronically retrieved publications.

If we rank the enquiry catalogue among the standard search aids and include those cases in which the enquiry catalogue and other conventional search methods have been simultaneously consulted, this would give us a figure of 54% of all searches settled exclusively in the conventional manner. And this despite the fact that mechanical catalogues and electronic data have been consistently adjusted to current needs.

To this we must add the 12% of searches in which conventional searches were made to supplement modern retrieval procedures. At present, these make up two-thirds of all searches. We can, therefore, safely say that documentation centres which are expected to work economically cannot at present forego the conventional search methods of medical libraries. Even documentation centres which are not required to work to a tight budget cannot dispense with them.

Looking at the question from the other angle, organizations which undertake literature searches as their duty cannot dispense with mechanical and/or electronic procedures. In 34%, these sufficed in themselves to settle the enquiry. In a further 12%, they had to be supplemented by standard searches.

Mechanical searches are in the long run always faster than electronic, if one does not oneself have a computer and has to wait until one is allocated free computer time by the computer centre. If one can get into a queue and work on-line in a batch-processing or even in a dialogue system, mechanical searches are slower, but as long as one company dominates the market and our rate of exchange system remains unchanged, mechanical searches are much cheaper than electronic. A cost-orientated organization in Europe cannot yet give up mechanical searching. It is not surprising that such searches are made without other means in 28% of our enquiries and in 18% as a supplement.

Electronic searches give results which in completeness and speed cannot be achieved by any other procedure. But given an inadequate searching strategy, they easily lead to over-information. And this is just as unwelcome to the user as its opposite, under-information. A large documentation centre can no longer get by without electronic procedures, but an analysis of needs must precede any run when one cannot ignore costs. Thus, it turns out that in only 7% of cases, *i.e.*, only 350 times a year, do we retrieve by computer. There are always literature enquiries which can be settled only by use of a computer, but in the everyday work of a documentation centre they are by no means the rule.

design and operation of an advanced computer system for the storage, retrieval, and dissemination of the world's biomedical information

P. J. Vinken, F. van der Walle and P. A. Warren

The computer, man's highly sophisticated memory machine, is now a recognized and accepted tool for the storage of man's knowledge. Its ability to accept and store vast quantities of data is well known. What we have attempted to achieve in the *design of a system for the storage, retrieval, and dissemination of the world's biomedical information* is to harness or program the computer so that it can provide an outflow of information pertinent and relevant to the scientist's needs, when he wants it most, and without the delays involved in the design and application of extensive search strategies. Without such design and programming, an economic, on-line, real-time system is virtually impossible to achieve.

Essentially, the basic difficulty, until now, in designing such a system in the biomedical field has been the lack of a precise and consistent biomedical terminology, with which to obtain what we might call a 'rifle shot', as opposed to a 'shotgun', approach to the data bank. As the tragedy of thalidomide most clearly illustrated, a drug cannot be rapidly identified unless it has a universally understood and accepted name, that is, an international non-proprietary name. In the medical sciences it is, of course, essential that the use of a particular term should be understood to designate a defined entity no matter the discipline, the geographic location, or the language.

Synonyms account for more than half of the medical terminology in any language. Some of the terms used are obsolete, many are incorrect, and others are little used except in specific geographical areas or by particular schools of thought. As Manuila has frequently pointed out, *Candida albicans*, for example, is discussed in the literature under more than 170 synonyms.

Apart from synonyms, there are problems created by the numerous ways in which a combination of the same words may be used for indexing purposes. The complications are increased with complex word forms, such as 'cervical disk hernia' (Tables I and II).

If the lack of standard terminology in any one language causes difficulty, it is an even greater task to equate synonyms in two or more languages. To illustrate the magnitude of this problem, consider the disorder 'myelofibrosis', which is known by at least 12 different names in English, 13 in German, and 31 in French.

This situation has obviously left the effective retrieval of information too much to chance, for it is clear that important observations and other data may be quite irretrievable, simply because of differences in indexing terminology. These, therefore, are some of the problems which pointed up the great need for the basic biomedical terminology studies which Excerpta Medica has now completed. In order to develop a precise and highly specific indexing system and hence design an 'in built' terminological control, or authority, for searching the data bank and retrieving the desired information, we have compiled, for our own information system, a thesaurus of biomedical terms called the Master List of Medical Indexing Terms, or MALIMET.

Table I. *Example of different synonyms for the concept 'cervical disk hernia', showing various ways they have been used in a subject index.*

disk hernia, cervical
cervical disk, hernia
cervical disk hernia
intervertebral disk, hernia, cervical
intervertebral disk, cervical, hernia
cervical intervertebral disk, hernia
cervical intervertebral disk hernia
hernia, disk, cervical
hernia, cervical disk
hernia, cervical intervertebral disk
hernia, intervertebral disk, cervical
hernia, nuclei pulposi, cervical
cervical hernia nuclei pulposi
slipped disk, cervical
cervical slipped disk
disk, slipped, cervical
intervertebral disk, slipped, cervical

Table II. *Possible variations of the adjective 'cervical' as used in the expression 'cervical disk hernia'.*

cervical
cervical spine
spine, cervical
spinal column, cervical
cervical spinal column
cervical spinal column
column, cervical spinal
vertebral column, cervical
column, cervical vertebral
cervical vertebral column

This list includes all biomedical terms, simultaneously excluding all synonyms and referring, where necessary, to related terms. The nomenclature resulting from this terminological research, which took us several years to compile, now comprises more than 60,000 preferred terms, and will eventually include about 500,000 synonyms and word forms. Any indexing term read into the storage and retrieval system is first automatically checked against the Master List. Obsolete and undesired terms are automatically replaced by the correct term or become a new accepted term. The responsibility for the maintenance and updating of MALIMET rests with a team of medical specialists, qualified and experienced in the current terminologies of all medical disciplines. In our opinion, the effective use of computers in medical documentation or in other fields of massive information can be thought of only on the basis of such a terminological authority.

design criteria

In determining the design of the computer system, the following requirements

were first established: storage and selective retrieval of approximately 200,000 citations annually from 3,000 international biomedical journals; storage and selective retrieval of at least 80,000 original abstracts annually; retrospective search services and SDI on all information in the data bank; and output of these on magnetic tape or hard copy print-out. In addition, we required that the system should be capable of processing and printing 33 monthly abstract journals, all subject indexed.

These criteria were met by the design of a system with random access search capability of the data bank. This system was found to have the following additional advantage: input and retrieval can be accomplished step by step, as each part of the information becomes available, and without the necessity of postponing input until more time-consuming parts relating to the document (*e.g.*, the abstract) have become available.

input procedures

The requirement to retrieve information on a specific subject as and when it is available led to the establishment of a sequential system for all input procedures. The first item of input is a comprehensive description of the bibliographic data of the information entity, *i.e.*, the *citation* of the article. The citation is divided into nine separate elements, which, separately or in combination with other elements (*e.g.*, indexing terms), can be used as selection criteria for a retrieval operation. These nine elements are:

1. Year of entry in data bank
2. Author(s) name(s)
3. Affiliation of author(s)
4. Type of entry (book, journal, report, etc.)
5. Title of periodical
6. Year of publication
7. Country of origin of article
8. Title of article in English
9. Original language of the article

Referencing the article to insure optimum retrieval is achieved by three separate procedures. The first procedure is a completely free one, namely, by the *assignment of subject indexing terms*. Indexing the article and input of subject indexing terms involve the selection of a set of terms for each document, denoting those concepts that will lead most effectively to its retrieval. The assignment of subject indexing terms is made only by the appropriate medical specialist editors of Excerpta Medica.

Primary indexing terms are verified against the controlled thesaurus (MALIMET). Either the preferred term or any of its synonyms may be assigned by the indexer, as the systems supervisor will automatically convert any synonym into the preferred term. It will also reject any term not at that time in the system. This has the advantage that it is unnecessary for the indexer to scan through a large list of acceptable terms, since all possible terms are present in the thesaurus with an indication of their correct relationships.

Table III. *Part of the classification of physiology showing decimal system.*

1. GENERAL ASPECTS
   - 1.1. History
   - 1.2. Techniques and apparatus
   - 1.3. Biomathematics and biophysics

2. CELL PHYSIOLOGY
   - 2.1. Membrane
     - 2.1.1. Permeability
     - 2.1.2. Electric phenomena
   - 2.2. Organelles

3. SMOOTH MUSCLE

4. DIGESTION
   - 4.1. Mouth
     - 4.1.1. Mastication
     - 4.1.2. Salivation
     - 4.1.3. Deglutition
   - 4.2. Esophagus
   - 4.3. Stomach
     - 4.3.1. Motility
     - 4.3.2. Secretion
     - 4.3.3. Absorption
     - 4.3.4. Regulation
   - 4.4. Small intestine
     - 4.4.1. Motility

- 7.4. Heart
  - 7.4.1. Muscle
  - 7.4.2. Conducting system
  - 7.4.3. Valves and sounds
  - 7.4.4. Electric activity
  - 7.4.5. Ballistocardiography
  - 7.4.6. Volume and pressure
  - 7.4.7. Output
- 7.5. Systemic circulation
  - 7.5.1. Arterial system
  - 7.5.2. Capillary system
  - 7.5.3. Venous system
  - 7.5.4. Lymphatic system
- 7.6. Lung circulation
- 7.7. Organ circulations
  - 7.7.1. Heart
  - 7.7.2. Kidney
  - 7.7.3. Liver
  - 7.7.4. Digestive tract
  - 7.7.5. Nervous system
  - 7.7.6. Peripheral circulation
- 7.8. Regulation
  - 7.8.1. Lung circulation
  - 7.8.2. Heart output
  - 7.8.3. Heart rate
  - 7.8.4. Blood pressure
  - 7.8.5. Coronary flow

12. URINARY BLADDER AND MICTURITION

13. NEUROPHYSIOLOGY
    - 13.1. Techniques of investigation
    - 13.2. Neuron
      - 13.2.1. Conduction
      - 13.2.2. Synapse
      - 13.2.3. Electric phenomena
    - 13.3. Reflex systems
    - 13.4. Motor functions
    - 13.5. Central sensory mechanism
    - 13.6. Psychophysiology
      - 13.6.1. Perception
      - 13.6.2. Conditioning and learning
      - 13.6.3. Emotion, motivation and behavior
      - 13.6.4. Consciousness
    - 13.7. Neuroendocrinology
    - 13.8. Neurosecretion
    - 13.9. Autonomic nervous system
      - 13.9.1. Cholinergic system
      - 13.9.2. Adrenergic system
    - 13.10. Electric activity

14. RECEPTORS
    - 14.1. Visual
      - 14.1.1. Optics
      - 14.1.2. Retina
      - 14.1.3. Motility

Secondary indexing terms are free, uncontrolled terms, which the indexer may wish to assign and which describe the character of a *given investigation* (*e.g.*, an anatomical, a demographic, or an electrophysiological study), the species of experimental animals used, and the type of primary document abstracted (*e.g.*, review, textbook).

The subject index is created through the successive rotation of the primary indexing terms only. Each primary term appears at the beginning of an index entry in the abstract publications. Secondary terms are never cited at the beginning of an entry, as they are not considered specific enough for useful searching.

The second procedure is the *classification* (Table III) of the article in all relevant categories of an overall classification system of the literature of the appropriate medical field, in other words, a semi-free system (EMCLASS). It is free in that it is open-ended. It is a decimal system where all of the ordinates of the system are fixed, but to which, if necessary, an additional last decimal can always be added.

The third procedure is by the assignment of *item indexing categories*. These are categories assigned by the indexer to the item for computer storage and retrieval only. They consist of a number of pre-established concepts of a general nature, not sufficiently specific for subject indexing purposes, yet adding relevant information on or restrictions to the citation in question. Space is reserved for additional concepts to be included in the file to meet specific individual indexing requirements of subscribers to the system for SDI services.

These three methods of referencing the article insure the greatest retrieval potential.

All *abstracts* are prepared by medical specialists qualified to analyze the content of the article and familiar with the language in which it is written.

Summarizing, it can be stated that a complete item in the data bank consists of the following parts: the citation, which gives an administrative description of the information; a number of primary and secondary indexing terms and item indexing categories, which describe the content of the information; and the abstract, which gives a condensed summary of the information entity.

output procedures

The following types of output are possible:

1. Classified titles, namely, the citations with the classification categories which have been input into the system. These can be used as current awareness services, as the time delay between the availability of the information entity and the output of classified titles is of the order of one to three weeks.

2. Periodical output of the complete description, including abstracts.

3. Periodical output of magnetic IBM-compatible 7-track tapes, containing the new items that have been introduced into the data bank since the last issue of a magnetic tape output. These tapes may contain either the total input in the data bank within that period, or a certain part of that input selected by using criteria to be specified by the subscriber (SDI tapes). The output of all data bank information can be selected according to one of four magnetic tape services (Table IV).

Table IV. *Excerpta Medica SDI magnetic tape services.*

Elements contained in the output	Tape service no. 1	Tape service no. 2	Tape service no. 3
Citations	Yes	Yes	Yes
Classification	Yes	Yes	Yes
Primary indexing terms		Yes	Yes
Secondary indexing terms		Yes	Yes
Item indexing terms		Yes	Yes
Complete abstracts			Yes

4. The continuous updating of the thesaurus, and the automatic check on the input, which is a built-in facility of the program, enable the thesaurus to be provided on a completely up-to-date basis, at quarterly intervals, or more frequently if required.

5. General information output. Apart from output which may be of interest for statistical studies, lists can be produced such as cumulated subject indexes and cumulated author indexes.

drug literature service

As part of Excerpta Medica's overall information system, there has also been successfully developed a new and comprehensive drug literature program designed especially to meet the needs for highly specific medical, chemical, and pharmacological information on all experimental and marketed drugs and chemical compounds, as reported in the international biomedical literature.

In addition to the assignment of medical indexing terms, the total input into the system comprises the following, designed to provide the maximum desirable information, with maximum retrieval possibilities in a minimum of time and at a minimal cost:

1. Full citation of the article
2. Generic name of the drug or compound (preferred term)
3. Chemical name
4. Experimental name and/or code, if an experimental drug or compound
5. Chemical structure information for all drugs (Wiswesser Line-Formula Chemical Notation)
6. Trade or brand name
7. Clinical indications or contraindications
8. Clinical and pharmacological effects
9. Untoward drug effects and adverse reactions
10. Name and location of the manufacturer

The total system is fully operational, and software retrieval programs are available, both for NCR 315 and IBM 360 series equipment. In addition, programs are under development for on-line, real-time information network and retrieval operations, employing these systems.

the work of medlars*

J. Leiter

I wish to limit myself here primarily to the work of MEDLARS, chiefly in the past and present and, to a limited extent, in the immediate future. My purpose is to describe MEDLARS as an operating system as it exists, rather than as one conceived it. When I entered the field of information dissemination a few years ago, I found it very difficult to adjust to the time frame that surrounded information systems. It seemed that frequently people talked of things as if they were in the present when really they were in the future, that information systems were frequently described in the indicative mood when it really turned out to be in the subjunctive mood, *i.e*, things they hoped to do.

It was, however, a gratifying experience to be involved in operational problems of a living system such as MEDLARS, despite a continuum of unplanned operational crises which sometimes make the halo of the future seem more attractive than the stark contrasts of the present realities. It is not that we shun the glamour of 'things to come'. Dr. Dimond (this volume, p. 10) described in some detail how we propose to extend the more mundane accomplishments of the past and present with the augmented capabilities that present-day technology affords.

MEDLARS is the current version of a bibliographic analysis of medical literature which has been carried out at the National Library of Medicine or its predecessor institutions for over a century. It developed out of a partially mechanized system used for the production of *Index Medicus*, using flexowriters, punched card equipment, and a Listomatic camera. MEDLARS was designed and implemented by General Electric. It became operational in January 1964 and has been in continuous operation since.

The system uses a Honeywell-800 computer with associated peripheral units and input devices and a computer-driven phototypesetting equipment Photon-900 known as GRACE (Graphic Arts Composing Equipment) to generate camera-ready copy for publication of MEDLARS products. The Photon-900, which was a prototype high-speed graphic quality photocomposing unit, has recently been replaced by a Photon-901, which is a production model.

The input to MEDLARS, as in the past, was provided by MEDLARS subject analysts, for the most part trained in a biomedical subject specialty. Index terms are assigned from a controlled vocabulary consisting of approximately 7,500 descriptors, 60 subheadings, and 12,000 cross-references. This controlled vocabulary, called MeSH, is published annually as Part 2 of the January issue of *Index Medicus*; it has also been recently included as part of *Cumulated Index Medicus*. About 2,300 journals are indexed. The number of articles input has risen from 140,000 to a rate which is currently exceeding 220,000 per year. The size of *Cumulated Index Medicus* has risen from three volumes and about 4,800 pages to five volumes and almost 9,000 pages in

* Some of the material presented in this lecture was also delivered at the 31st Annual Meeting of the American Society for Information Science on October 20-24, 1968, and published in the *Proceedings* (Leiter and Gull, 1968).

Table I. *Recurring bibliographies.*

Bibliography	Sponsor	Frequency
Anesthesiology bibliography	American Society of Anesthesiologists	Bimonthly
Artificial kidney bibliography	National Institute of Arthritis and Metabolic Diseases, NIH	Quarterly
Cerebrovascular bibliography	National Heart Institute and National Institute of Neurological Diseases and Stroke, NIH	Quarterly
Endocrinology index	National Institute of Arthritis and Metabolic Diseases, NIH	Bimonthly
Fibrinolysis, thrombolysis, and blood clotting bibliography	National Heart Institute, NIH	Monthly, annual
Index to dental literature	American Dental Assn.	Cumulating quarterly
International nursing index	American Journal of Nursing Company	Cumulating quarterly
Bibliography on medical education	American Assn. of Medical Colleges	Monthly, annual
Index of rheumatology	American Rheumatism Assn.	Monthly
Bibliography of surgery of the hand	American Society for Surgery of the Hand	Quarterly, annual
Toxicity bibliography	National Library of Medicine	Quarterly
Current bibliography of epidemiology (CuBE)	American Public Health Assn.	Monthly
Neurosurgical biblio-index	American Assn. of Neurological Surgeons	Quarterly
Cranio-facial — cleft palate bibliography	American Cleft Palate Assn.	Quarterly
Index of investigative dermato-pathology and dermatology	Universities Associated for Research and Education in Pathology, Inc.	Monthly

1968. We project that at least six volumes will be required for 1969. The total number of citations stored in MEDLARS will pass the one million mark in about two months.

The MEDLARS system was designed to provide two major categories of products: publications, and retrospective bibliographic retrievals from the data store called demand searches. This dual function has required design considerations which have imposed limitations on the capabilities for either product.

The principal publications of MEDLARS consist of bibliographic indexes which form the basic backbone of MEDLARS printed products, such as *Index Medicus*, *Cumulated Index Medicus*, recurring bibliographies, *Current Catalog* and its quarterly and annual cumulations. The *Monthly Bibliography of Medical Reviews*, which appears as a part of *Index Medicus*, is also reprinted as a separate publication at a very modest cost so that it may provide a desk-top tool for users to get access to subject areas new to them. Also generated are products such as MeSH, the MEDLARS

thesaurus, and the *List of Journals Indexed.* Selected demand searches that are considered to be of widespread interest are photocomposed on GRACE and printed in lots of 500 to 1,000 copies. These are announced in several publications and have proved to be very popular.

Programs have been developed to generate recurring bibliographies as a subset of *Index Medicus.* A variety of formats have been developed and there are 15 currently in production (Table I). All these bibliographies are developed in close collaboration with professional societies or institutes of the NIH. The Library produces the camera-ready photocomposed copy and the sponsoring institution or professional society publishes and distributes the bibliography. Some are available by subscription, others have limited circulation by the sponsoring organization. Because of the complex search strategies that are frequently needed to generate such bibliographies with a minimum of nonrelevant citations, a number of pilot runs are needed, and close collaboration and critical review by the subject specialists are required before a quality product can be generated. In some instances, such as in the development of the dental, rheumatology, and endocrinology bibliographies, extensive review and overhaul of portions of our thesaurus were required, resulting in an overall improvement in MEDLARS and its other products. It generally requires about a year to complete the iterations and analysis to produce a recurring bibliography.

The storage of citations in machine-readable form, coupled with a large increase in the number of descriptors used, provided a capability for performing retrospective searches tailored to the needs of individual research workers. These demand searches, as they are called, were initiated on a pilot scale when MEDLARS became operational in 1964. These were well received and there has been rapid growth in the number processed over the past six years. There has been no diminishing of demand to reflect any satiation on the part of users (a phenomenon that is not unusual when the first flush of enthusiasm for a new product passes); rather, the service has produced continued stress on the MEDLARS system during this entire period. Table II tabulates the number of searches released during each fiscal year (which begins on July 1 of the preceding calendar year). A growth from 621 searches in 1964 to an estimated 15,000 for the year ending June 30, 1969, reflects this rapid growth.

Needless to say, the NLM never could have developed the manpower and resources to satisfy these growing demands. An early decision was made in 1964 to decentralize demand search capability. In addition to providing increased capacity, it brought the search analyst closer to the user so that better interactions could be obtained. Although it was originally intended to provide both search-formulation capability and computer-processing capability at these centers, initial problems in

Table II. *Medlars demand searches released.*

Fiscal year	Number released
1964	621
1965	1,623
1966	3,035
1967	6,275
1968	10,418
1969	15,000 (estimated)

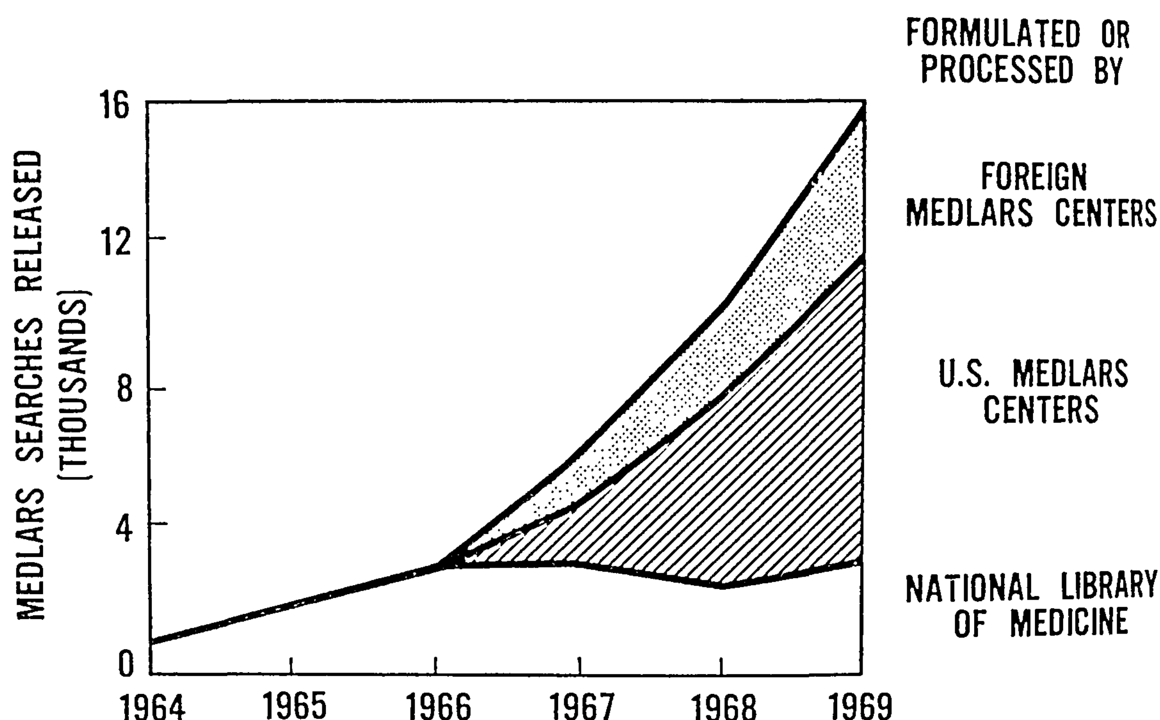


Fig. 1. MEDLARS demand searches released.

writing conversion programs for other computers and problems of access to non-dedicated computers and programming support made it necessary to modify this approach. Most centers provide only search-formulation capability, and searches were processed centrally on the NLM computer. A small number of computer-processing centers were established as backup. This also proved to be a saving grace as the NLM facility became overloaded: a switching of overloads to other processing centers was instituted. As early as 1966, networking and load switching were practiced for both search formulation and computer processing, providing the primitive skeleton for the future library network component of the biomedical communication network which Dr. Dimond described.

At the present time, computer programs exist for processing demand searches on IBM 7094, 7040, 1401-7090, 360/40 systems, and on the English Electric KDF/9.

The impact of decentralization just described becomes apparent as the data in Table II are presented in Fig. 1. The dramatic effect of decentralization is clear. Only about 20% of the search requests are currently released by NLM. The major resources of NLM are thus oriented to management and support of network activities and to providing backup and support to the MEDLARS centers.

The capabilities of the MEDLARS network were augmented when regional medical libraries were established as a result of the Medical Library Assistance Act of 1965. A number of these regional libraries have established MEDLARS centers to augment the capabilities of the existing centers. Table III lists the MEDLARS centers which have been established both in the U.S.A. and abroad. Several additional centers have been established or will be functional in 1969. The MEDLARS station at the University of Washington has recently begun functioning as the MEDLARS center for

Table III. *Medlars centers.**

Center	Time established	Time functional
Colorado	1964	1964
UCLA	1964	1966
Harvard	1966	1967
Michigan	1966	1967
Alabama	1966	1967
Ohio State	1967	1967
Texas	1967	1968
National Institutes of Health	1966	1967
National Library of Medicine		1964
United Kingdom	1965	1966
Sweden	1965	1966
Australia	1969	1970
France	1969	1970

Region 10, the Pacific Northwest, as part of that Regional Medical Library. A MEDLARS center organized through the Pharmaceutical Manufacturers Association in Washington has become functional to serve the pharmaceutical industry. Search analysts are currently in training to man the regional libraries at Chicago and Philadelphia, and a functioning MEDLARS center is anticipated at the New York Academy of Medicine Library before the end of this year for the New York Regional Library.

Almost concurrently with decentralization plans in the U.S.A , interest developed for establishing MEDLARS centers abroad. Experimental MEDLARS centers were established in 1965 in the U.K. at the NLL under the auspices of OSTI, and at the Karolinska Institutet under the auspices of the Swedish Medical Research Council. Unlike the experience in the U.S.A., it was considered essential to have these centers established with full processing capability. The experience with both these centers was extremely gratifying. Operational programs were established in 1966, and after two years of experimental operation, formal agreements were consummated with both centers in 1968. An agreement has recently been negotiated with the National Library of Australia. Programs for processing searches on an IBM 7040 have been completed and two search analysts are currently in training in Bethesda. Negotiations are virtually complete for establishing a center at the Institut National de la Santé et de la Recherche Médicale in France. In addition, two search analysts have completed training for WHO and the formal establishment of a center at Geneva in the near future is anticipated.

The success of the two MEDLARS centers in Europe stimulated interest for such centers in virtually every country in Europe as well as in other parts of the world. With the limited resources available at the Library, and our recurring needs to keep the system in operation, it was impossible to satisfy these requests. Over two years ago we made an effort to develop a multilateral agreement under the auspices of OECD to establish additional centers in Western Europe on a phased basis. Despite concerted

* As of February 1970, agreements have been concluded to establish MEDLARS centers in Geneva with WHO, in Germany with the Deutsches Institut fur medizinische Dokumentation und Information, and in Japan with the Japan Information Center of Science and Technol

efforts on the part of OECD and the participating countries, the inexorable pressures to develop individual bilateral agreements prevailed. On this basis, the Library has agreed to establish one additional center in Europe each year. The first such agreement will probably be established with France in 1969. Active negotiation is proceeding for establishing an additional center at the German Institute for Medical Documentation and Information in 1970. Close collaboration with OECD is still maintained.

The NLM requests applicants to submit a technical plan to provide assurance that adequate financial and technical resources are available and that a realistic assessment of the user potential has been made. Because of the substantial investment in maintaining the operation of a network and the additional resources involved in servicing centers, the Library has requested a *quid pro quo* from each of its partners in the form of input to MEDLARS in the form of indexing, cataloging, procurement of journals and monographs, etc., to offset this cost. Centers have generally undertaken to input those journals in the MEDLARS base originating in their countries or in related language areas. Indexing is well under way in the U.K. and Sweden and has begun on a pilot basis in France. The effect of this effort will be shown later.

The establishment of all the centers has placed a major strain on the Library for training qualified MEDLARS analysts. In the early phases of the program, training suffered from relatively poorly organized and conducted courses at the Library. We now have greatly improved curricula and are able to provide a sound training program. We currently require a six-month course of lectures and work training for MEDLARS analysts who go to a newly established center. Where there are established centers with experienced analysts for supervision, the training program may be reduced to four months in some instances.

MEDLARS demand searches appear to be most heavily used by government and research-oriented scientists. Table IV summarizes institutional affiliations of user groups based on a sample of 908 searches selected from 3,389 successive searches processed about a year ago. Although hospitals represented about one-fourth of the group, they were primarily research hospitals associated with universities. If all non-institutional physicians were considered to be in general practice, this would account for only 3% of requests. Requests from industry were surprisingly low. This number has increased substantially under the auspices of the Pharmaceutical Manufacturers Association MEDLARS center.

Table IV. *U.S. MEDLARS user population.*

User group	Searches no.	Processed percent
Government	239	26.2
Universities	330	36.3
Research institutes, etc.	38	4.2
Hospitals	222	24.5
Physicians (non-institutional)	28	3.0
Industry	29	3.2
Miscellaneous	22	2.4
Sample size	908	
Total searches processed	3,389	

It became apparent during evaluations of MEDLARS searches that user orientation and understanding of the system were important elements in providing better responses. For this we are particularly indebted to our British colleagues. Dr. Harley, who addressed you earlier (this volume, p. 138), has maintained a three-day orientation program for a number of years. Dr. Harley was kind enough to run a number of these programs for us in the U.S.A. about a year and a half ago. We proceeded to tailor user orientation programs to meet our American needs and have generated a series of modular lectures and demonstrations similar to the British programs. These can be given in a period ranging from half a day to a whole day. Particular emphasis is placed on a 'MEDLARS in context' lecture which extols the virtues of other information resources such as *Science Citation Index*, *Excerpta Medica*, *Biological Abstracts*, and *Chemical Abstracts*, which can frequently augment, complement, and, in some cases, provide better information than MEDLARS. A lecture on 'Capabilities and limitations of MEDLARS' is a final message we try to impress on our users with a realistic outline of what to expect from MEDLARS.

On a number of occasions I have indicated that all was not smooth sailing. It was not only problems of management and growth that plagued us. In common with most systems, many problems in operational experience could be traced to a mismatch between the projections in the systems plans and actual operational experience. It is to the credit of our MEDLARS analysts and vocabulary specialists that they were able to cope with these matters and adapt the system to actual needs.

Our small vocabulary-development group has had a particularly difficult time coping with major vocabulary changes which operational experience dictated. The design of the system did not provide adequate maintenance procedures (a failing of most systems). Better control of the increasing needs for inadequately covered biomedical areas were developed through use of advisory groups, through professional user groups who collaborated in the development of recurring bibliographies, and through active liaison with organizations concerned with vocabulary development. Table V gives a partial list of such groups.

A major impact of MEDLARS was reflected in index input. This resulted not so much from computerization as it did from the inability of the resources to cope with the mounting demands imposed on human analysis required for indexing. A move to indexing in depth, which raised the number of descriptors for each citation to a level of about ten from three or four, resulted in a reduction in indexing productivity from seven or eight articles per hour to five or less. A major overhaul of titles indexed reduced the total number of titles, but introduced publications of higher quality with substantially increased numbers of citations per issue. Hidden backlogs resulting from

Table V. *General MeSH program liaison.*

National Libraries Task Force
CIOMS (disease classification) (WHO)
Drug Information Association (drug classification)
ICSU/UNESCO Joint Committee on World Science Information System
American Cancer Society
NINDB network
NIAMD Nutrition Committee

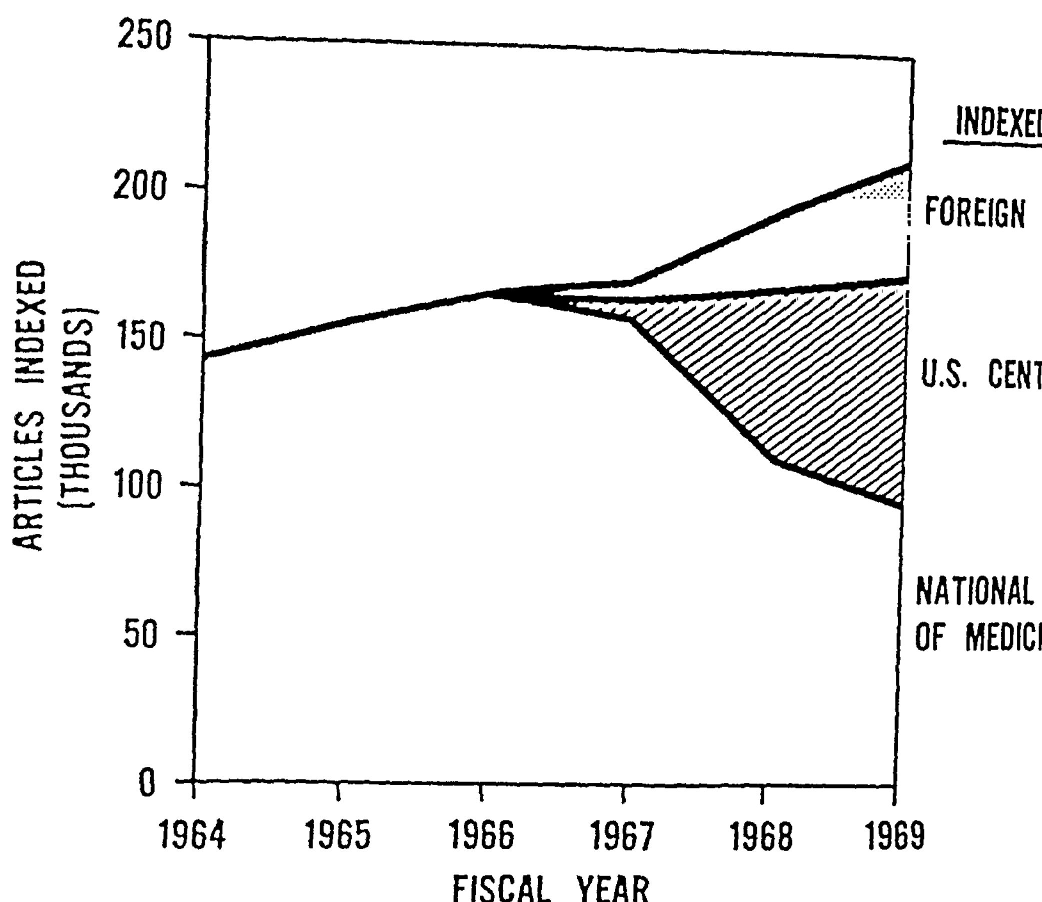


Fig. 2. Articles indexed for MEDLARS.

greatly improved claiming procedures and from historical liens raised th backlog to alarming levels. Training requirements for MEDLARS further the manpower available for indexing.

A decision to depart from the long tradition to maintain indexing as an 'i operation is paying off handsomely in resolving this crisis. In 1966 the first for outside indexing was established in Japan with Keio University. A very sati experience led to extension of outside indexing to other centers in Israel, MEDLARS centers, and with commercial companies in the U.S.A. During year, active indexing was begun at the MEDLARS centers in the U.K. and Sw part of the *quid pro quo* referred to earlier.

Figure 2 presents a similarly dramatic picture, as did demand searc Fig. 1), in showing the effects of this activity. About 60% of the indexing is c performed off-site. The quality of the indexing is comparable in every way conducted in-house. As a result, our indexing is currently at a level of about articles a year. We are now in positive balance and are eroding our backl significant rate. The full impact of the indexing from our foreign MEDLARS has yet to be felt. We are essentially current in English language with a large in non-depth Romance languages and a significant backlog in non-depth Russ these areas, backlogs of almost two years still exist. The total backlog is 52, about 2½ months of input. We are so current in English language that we som

Table VI. *Throughput time for quality journal (Sample 326 issues).*

Date of receipt to Date released by printer	Journal issues No.	Cumulative percent
Days		
0-24	3	0.9
25-34	18	6.4
35-44	72	28.5
45-54	90	56.1
55-64	81	81.0
65-74	27	89.3
Greater than 75	35	100.0

have difficulty in providing English articles for indexing by MEDLARS trainees. The influence of decentralized indexing on throughput has been mixed. Where indexing has occurred in the country of origin, such as the U.K. and Japan, we receive the indexed material about the same time or occasionally sooner than our normal subscription.

We index our depth journals on a priority basis, and the backlogs tend to exist in non-depth articles. Most of the more significant material is published within two months of receipt at the Library. Table VI gives an analysis of throughput time for a series of journal issues taken off our production control sheets. Included in this time is an average three-week period between our delivery of camera-ready copy to the printer and the time we receive our copies.

With all the efforts to maintain operational integrity and to keep abreast with expanding requirements, the Library felt it imperative to analyze and evaluate the performance of MEDLARS in order to provide continuing input for upgrading its quality. An ambitious program was undertaken by Mr. F. Wilfrid Lancaster in 1966 for evaluating MEDLARS demand searches. About 300 actual requests during 1966 and 1967 were exhaustively analyzed. Co-operation with users was obtained to provide assessments by reviewing actual documents of retrievals. Relevance and recall assessments were made and a detailed analysis of failures was performed. The results of this study were published last year (Lancaster, 1968) and provided during its execution an important feedback for improvements in the operating system, many of which have already been described, and also provided support and insight for requirements built into the development of our next generation of MEDLARS.

The operating experience in MEDLARS which this study indicated shows an overall recall of 60% at a precision of about 50%. This operating experience was substantially modified by practices of search analysts in different centers, resulting in considerable variation in recall and precision that occurred in five of the MEDLARS centers (including NLM). The real heart of this study was a phenomenal amount of work that Mr. Lancaster did on diagnostics of failures on about 4,000 documents. It was evident that there is substantial room for improvement in [illegible] in [illegible] intellectual areas, not to speak of machine problems and failures.
us with highly motivated objectives over the next few years.

It is clear that we have operated a successful computer [illegible]

for six years and have provided much of the augmented services and capabilitie
have approached the original objectives to a significant degree, and in fact prc
better capabilities than had been designed. It is also clear that this success has no
easy, and has been marred by operational difficulties due to overloading, u
capacity, inadequate systems planning, systems maintenance, and, above all, int
tual flaws which the hard retrospective view of operational experience uncover

Our system was designed to operate for five years. We are completing six
soon. In a sense, we are living on borrowed time. Beginning in 1967 the Li
initiated plans to expand and upgrade the system to expand our goals and to pr
the capabilities which current technology affords. In June of 1968 we awar
contract for design and implementation of MEDLARS II. This will be a 3- to 4
project of incremental upgrading with a first phase of implementation early in

When fully operational, the system will incorporate increased processing
bility, intermediate access storage, time-sharing, and on-line access to data
from remote terminals. Translated into capabilities, this will provide: a g
increased file capacity which will permit maintenance of abstracts; quicker respo
increasing volumes; more current data through on-line record updating; a
automated acquisition and cataloging system with cataloging available to and
other libraries through remote terminal access; development of specialized inform
services for drug literature, toxicology, and for such networks as the Nat
Institute of Neurological Diseases and Stroke; and support of the data-processin
data-transmission activities of the biomedical communication network
Dr. Dimond described.

In closing, I cannot resist showing this last figure (Fig. 3). One of my staff
it out of a paper he read a few months ago. It obviously reflects the inadequ
with which we handle our information affairs. It also points up the old adage a
a cobbler going barefoot. Although I have been anxious to give appropriate
to the author (unknown), we have not been able to find the citation for several w
I hope the author will accept my apology for not giving appropriate and well-des
credit.

ALL WE ARE NOW DOING IS
VSING MODERN TOYS AND
IN-TALK TO EXPAND SERVICE
PATTERNS WHICH HAVE PROVE
TO BE INEFFECTIVE

Fig. 3.

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VII

automatic indexing of medical literature: the medico system*

S. Artandi

It has become imperative that systems of automatic indexing in natural language text replace or minimize the human intellectual work required for indexing. In the first place, it is difficult to find personnel who are either qualified or willing to do this important task. Secondly, the amount of published literature requiring indexing continues to increase exponentially. Research in automatic indexing is expanding and receiving support. Computers are more readily available today at lower costs. The time is ripe and the need apparent.

Project MEDICO (Artandi and Baxendale, 1968; 1969; Artandi, 1970), a research project using medical literature, was conceived as a system of automatic natural language indexing, where index tags for documents are automatically generated by a computer instead of being assigned by human indexers. The computer scans the natural language text of a document and is programmed to assign index terms on the basis of explicitly defined text characteristics. The method should be distinguished from mechanical storage and retrieval systems in which a machine-searchable file is created from indexing done by humans.

Intellectually, automatic indexing methods suffer from an insufficient understanding of the complex relationship between the meaning of text and the words which appear in it. Because of the lack of sophisticated linguistic knowledge which would help to understand this relationship, the algorithms which have been formulated for computer indexing have been largely based on words in documents. Such things as the number of occurrences of words, the co-occurrence of words, the relative position of words, the characteristics of strings of characters constituting words, and comparisons or partial comparisons with stored dictionaries have formed the bases for automatic indexing methods (Artandi, 1968; Stevens, 1965).

The objective of Project MEDICO, which builds on earlier work at Rutgers on automatic book indexing (Artandi, 1963; 1964), was to create automatically a machine-searchable index record for English-language medical journal articles. The primary emphasis was on drug-related information. A stored dictionary and the characteristics of string patterns constituting words were used to alert the computer to the presence of information in the texts that merited indexing. Whenever certain predefined text characteristics are present, the computer will automatically choose and assign from a controlled vocabulary the appropriate index terms for the document. Thus, the variety of words used in natural language text is taken into consideration in indexing and a standardized output, using a controlled vocabulary, is created for more convenient and less ambiguous searching.

For each document, the indexing program creates a record giving author, title,

* The research described in this article was conducted under a grant from the Public Health Service/National Library of Medicine. The indexing program was prepared by Mr. Stanley Baxendale of the Rutgers University Department of Computer Sciences, and the IBM 7040 computer was used in the project.

bibliographic citation, index terms without modifiers, with their respective weights and *Chemical Abstracts* registry numbers, and index terms with modifiers, with their respective weights.

The print-out for a record displays all the index terms assigned to the document. This is useful because the terms, when taken together, can serve as a rudimentary abstract. These should not be considered substitutes for good informative abstracts, but they do have a certain degree of usefulness.

To create the index record automatically the indexing program was designed to satisfy some major requirements: to recognize information in a text that should be indexed, to switch from a variety of text words to a controlled vocabulary and create a standardized index record, to be able to handle both single-word and multiple-word terms, to create appropriate links between drug names and their modifiers, to calculate weights, and to provide for expandability. Indexing of drug-related information in medical journal articles uses relatively standardized language, but it also deals with the complexities involved in the naming of chemical compounds and of drugs.

We were able with MEDICO to index a given document with a degree of precision which made it possible to retrieve information about a given drug regardless of the name given for that drug in the document being used. Most drugs have three names: the chemical name, which is a scientific and precise description of a chemical substance; the generic name or non-proprietary name, which is an abbreviated and frequently arbitrary version of the chemical name; and the trade (brand, proprietary) name which refers to a particular manufacturer's product. With these three names there is an automatic capability to link a variety of trade names to a particular chemical composition and to the equivalent generic name. The display of these relationships and of other indications of document content in the index record is utilized in the mechanical searching of the automatically produced file.

To create index records with a controlled vocabulary, equivalencies among chemical, generic, and trade names were established and, both for drug terms as well as other types of terms, the particular form which should appear in the index was designated. To provide access points at various hierarchical levels a 'package' was associated with each drug name. A package consists of those terms which will appear in the index record whenever an equivalent drug term appears in the document text.

Packages were established with the desired primary access points in mind and they provide four hierarchical levels for searching. The most specific level is the trade name; at the next level are the chemical name, the generic name, and the *Chemical Abstracts* registry number; at the third level is the chemical group name; and at the fourth is the name indicating the activity of the drug. For example: at level one, there could be Lifene; level two, N-Methyl-2-phenylsuccinimide; level three, Succinimides; and level four, Anticonvulsants.

The *Chemical Abstracts* registry number uniquely identifies specific compounds and serves as a unique machine address of that compound in the *Chemical Abstracts* registry system. The number serves as a tag to identify all information associated with a given compound throughout the *Chemical Abstracts* system and its presence in the MEDICO index record provides an information access point which could open up important additional sources of information for the user.

The patterns of strings of characters constituting text words are used to detect potentially useful information in the document text. To do this we explored characteristics which can, with a reasonable degree of certainty, distinguish names of drugs from other text words. Such drug name characteristics as length; an alternating string of numbers, letters, and dashes; the presence as part of the name of such words as ethyl, methyl, etc.; or the presence of Greek letters were explored. For example, because we found that organic compounds tend to have long names, the indexing program will select strings of characters exceeding 18 characters and not contained in the dictionary. These are put out for human inspection, and when judged to be useful, they are put in the index record of the documents which generated them and are also used to update the dictionary.

Whenever the content of an article demands it, appropriate index terms are used to modify, or make more specific, the names of drugs or chemicals. We wanted modifiers to give also some indication of the context in which the drug names appear in the articles. To avoid false co-ordinations, modifiers are linked in the machine record to the drug reference. Linking is done automatically by the computer, simultaneously with indexing, and is based on the assumption that co-occurrence within a sentence is a satisfactory indication that the terms belong together within the context of the document. Therapy, activity, side effect, administration, are examples of modifiers used in the system.

Here are two examples of sentences from which links between drug terms and modifiers were automatically generated. 1. 'Another class of drugs which are effective against grand mal epilepsy are the hydantoins, especially diphenylhydantoin.' This information was indexed as **Hydantoins/epilepsy** and **Diphenylhydantoin/epilepsy**. 2. 'Treatment with anticonvulsants is always on an individual basis, and there is no general scheme of dosage. . .' This information was indexed as **Anticonvulsants/therapy** and **Anticonvulsants/dosage**.

To indicate the relative importance of a term in the document description, weights are assigned automatically by the computer. The method for computing weights is based on the assumption that the frequency of occurrence of a term, under any of its forms, can be used to determine its weight. To compensate for differences in length among articles, the computer calculates relative frequency, the number of occurrences per thousand text words. The resulting figure is converted into a weight in the following manner. If the frequency of the term per 1,000 words of text is less than or equal to 1, the article is assigned a weight of 1. If the frequency of the term per 1,000 words is greater than 1 and less than 3, then it is assigned a weight of 2. Finally, if the frequency of the term per 1,000 words is greater than or equal to 3, then it is assigned a weight of 3.

MEDICO is designed to produce index records for documents which will allow searching at four hierarchical levels. The primary access points of the index file can be further utilized through Boolean searches for the retrieval of highly specific information. The use of the Boolean connectives **and**, **or**, and **not** enables the system to answer search questions requiring the presence or absence of several parameters in specified combinations.

Examples of the type of access the primary access points can provide are the

following. Searching on the chemical name will automatically produce all the articles in the system which describe trade products with that particular chemical composition. This valuable piece of information can be also obtained through a search on the *Chemical Abstracts* registry number, which is automatically assigned by the indexing program to each chemical compound indexed. A search on biological activity will yield the names of trade products and of chemical compounds which are relevant to that particular activity. A Boolean search on biological activity and chemical group name will select documents describing those compounds in the chemical group which are relevant to the biological activity. Examples of more specific questions requiring the formulation of more complex Boolean expressions are: 1. What is the effectiveness and the permissible dosage of trimethadione in anticonvulsant therapy? 2. Which barbiturates other than phenobarbital have anticonvulsant activity?

The automatic indexing of full text just described raises a number of important questions concerning the validity of the assumptions which formed the bases of the indexing algorithm. The methods developed for the calculation of weights and for the generation of links (Artandi and Wolf, 1968; Artandi, 1970) are of special interest. How effectively can the relative frequency of occurrence of terms be used to determine the importance of a subject in a document? How effectively can links be established at the sentence level? What is the significance of linear distance within a sentence between index terms and modifiers? When we evaluated our automatic indexing program, we were concerned with a comparison between the judgment built into the algorithm developed for the computer and the judgment of the human indexer. In automatic indexing the same algorithm is applied in the indexing of every document in the system; in human indexing the indexer makes a separate judgment for each document.

Fifteen articles were selected for the evaluation tests. The articles were scanned by a human indexer who checked the correctness of the weights appearing in the output of the automatic indexing program. The links in the output were checked to determine whether they were correct in the context of the sentence.

As was already indicated, the algorithm for the automatic assignment of weights utilizes text characteristics on the basis of purely quantitative criteria. The manual checking of weights involved subjectivity on the part of the evaluator. A weight of 3 was judged correct for a term which in the opinion of the evaluator was central to the theme of the article, a weight of 2 for a subject of minor importance, and a weight of 1 when the subject was considered incidental to the theme of the article. On the basis of this, the number of agreements and disagreements was recorded for each document. The automatic and the manual methods were said to agree when both assigned the same weight to a particular index term.

In the evaluation of the linking procedure, again the MEDICO output was compared with manual results. The purpose of the test was to determine the proportion of relevant links, to determine whether writing style has an effect on the proportion of relevant links, and to consider criteria other than co-occurrence in a sentence in defining a link.

A comparison between the output generated from full text with output from abstracts or summaries of the same articles was also included in the evaluation. This

type of comparison is important because there is good reason to believe that the difference in cost between the two methods is considerable. Data relating to the relative effectiveness of the two methods should give some indication of the degree of improvement that can be expected for the additional expense involved in full text processing.

The purpose of this investigation was to evaluate the following questions. Does an abstract provide a better index than a summary paragraph ? Do the terms which have a weight of 3 in the full text index appear more frequently in the reduced text index than terms which have a weight of 2 or a weight of 1? Can we consider the link distance or some function of the average link distance in order to segregate relevant and irrelevant links?

The various statistical tests gave some interesting results. A comparison of the weights assigned to terms using the MEDICO and manual procedures gave the same value for 71% of the terms generated by either procedure. A moderate increase in agreement (78%) was observed when only terms having a weight of 3 by at least one of the methods were considered. Ninety-eight percent of the weights assigned by the two methods were found to be either in agreement or to differ by a weight of no more than 1. These findings seem to indicate that the effectiveness of the method of weighting can be improved by allowing only two weights in the system instead of three. Future research would be required to check the validity of this assumption.

Seventy-two percent of the links generated by a full text scan of the articles by the MEDICO procedure were relevant. While writing style does not appear to have an effect on the proportion of agreements on weights for the two methods, the percentage of relevant links observed was found to be dependent on the author's writing style. The proportion of relevant links decreased as the length of the sentences increased.

A comparison of the index terms generated from full text with those which were generated from reduced text showed that the proportion of terms indexed from reduced text is greater for those terms which had high weights in the full text analysis. Eighty-six percent of terms having a weight of 3, 46% of the terms having a weight of 2, and 11% of the terms having a weight of 1 in the full text analysis were also generated from reduced text.

The findings show that the MEDICO automatic indexing method compares favorably with manual indexing. There is also indication that some modifications in the indexing algorithm would help to further improve the results. The use of two instead of three possible weights and the specification of co-occurrence between two punctuation marks instead of co-occurrence within a sentence for links should be tested for their effect on the indexing output. While Project MEDICO is concerned with drug-related information, the method is in principle suitable for the indexing of texts in other fields as well, with some modifications in the program to accommodate the terminology of the particular field in question.

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VIII

sabir: methodological and linguistic criteria

D. Rimbert, J. P. Reversat and M. Wolff-Terroine

SABIR-C (Système Automatique de Bibliographie, d'Information et de Recherche en Carcinologie) was created by the Scientific Documentation Service of the Gustave-Roussy Institute at Villejuif (France). It analyses the carcinological literature of all countries and has international circulation. This system is founded on the qualitative selection of documents. Its purpose is to achieve a detailed and highly scientific standard of information, as much by the choice of obtained documents as by the finesse of the criteria which allows us to select them.

The selection of documents, their analysis in depth, that is to say, the selection of the concepts which concern the study of cancer, and also the expression of those which represent the level of finesse of the article, have to be accomplished by physicians and scientists. The same option is used but in a different manner to retrieve documents from the store thus formed. These physicians and scientists are chosen because they actually work in specialized clinical fields of cancer research. It is, indeed, obvious that this double selection of documents and concepts can only illustrate the actual scientific progress if this selection is made by physicians and scientists who interpose their authority within the limits of their own specialization. This necessity already makes itself felt at the level of analysis. The recognition, in the heart of an article, of both classical and new ideas which concern a precise field of cancer research is obviously the lot of scientists engaged in the actual progress of this specialty. We will see later that this necessity also appears in other stages of the system.

organization of the vocabulary

On the other hand, the mere fact that the analyst has to be qualified makes it necessary to reduce his work to an intellectual level by relieving him of part of the formalization, which presupposes a documentary language. This work of translating into standard forms of expression is made automatic by means of a *dictionary of synonyms* which is enriched as the products of analysis are submitted to it. This dictionary thus constitutes a perfect reflection of the actual change of scientific vocabulary and of the various forms it can assume. The recognition of synonyms is made in the framework of a given documentary language conceived in terms of its scientific character and of the limits of the field it describes. It is, therefore, obvious that it concerns work reserved for the specialists mentioned previously.

Likewise, the recognition of synonyms in the scientific lexicon of several languages is not within the scope of linguists, even of excellent linguists, but again in the sphere of physicians and research workers. *Translation* of vocabulary in SABIR exists at present for English and German; possibly other languages will be included later. This allows for building and exploiting the document store in French, English, and German without risking conceptual distortion.

Having come to the analysis of the carcinological literature, to guarantee the

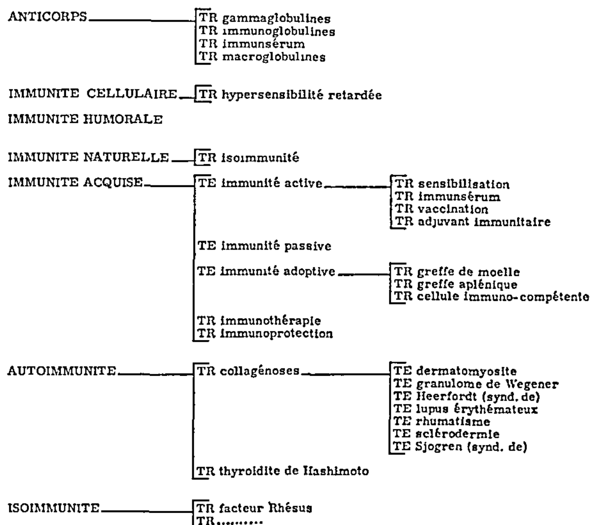


Fig. 1. Extract of a synoptic table: immunology. TL = broader term. TE = narrower term. TR = related term.

quality of the analysts' *selection of concepts*, the dictionary part of the SABIR responds to the demands of utility and economy. As soon as it appears in the literature, the concept engenders a term in the documentary language, which follows the vicissitudes of the scientific evolution of the concept, eventually becoming entwined with it in other more refined concepts, and thus the qualification 'elementary' is always a description of current scientific knowledge. After all, when a concept disappears, the word then becomes historical.

The dictionary part of SABIR incorporates a *semantic organization*, which *translates statements of implicit reports into concepts. This organization is essentially* evolving, and thus forms a real picture of medical and scientific understanding in the study of cancer. Given new documents and controversy among scientists and phy-

TUMEURS BENIGNES DES OS - 3BF 2

TISSU CARTILAGINEUX

Ostéochondrome
- = Exostose osteocartilagineuse
- E. P. Ostéochondromatose
- T. E. Maladie exostosante = Maladie ostéogénique
  - = Chondrodysplasie déformante héréditaire

Chondrome
- E. P. Enchondrome
- E. P. Ecchondrome
- T. E. Chondromatose
- T. E. Ollier (Mal. de -)

Chondroblastome bénin
- = T. Calcifiée à cellules géantes
- = T. Epiphysaire chondromateuse à cellules géantes
- = T. de Codman

Fibrome chondromyxoïde

TISSU OSSEUX

Ostéome

Ostéome ostéoïde

Ostéoblastome bénin
- = Ostéome ostéoïde géant
- = Fibrome ostéogénique (terme à éviter)

TISSU FIBREUX

Fibrome non ossifiant
- = Fibrous cortical defect
- = Metaphyseal fibrous defect
- = Fibrome non ostéogénique

Fibrome desmoplastique

ORIGINE VASCULAIRE

Hemangiome
- T. E. Angiome capillaire
- T. E. Angiome caverneux

Hemangiopericytome

Lymphangiome

TISSU GRAISSEUX

Lipome

TUMEURS A MYELOPLAXES (Préciser le degré de malignité)
- = T. à cellules géantes
- = Ostéoclastome

NON CLASSES :

Kyste anévrysmal de l'os
Kyste épidermoide
Kyste solitaire de l'os
Dysplasie fibreuse de l'os
- T. E. Mal. de Jaffé-Lichtenstein
- T. E. Mal. d'Albright

Histiocytose X (granulome éosinophile..................)
Maladie de Paget de l'os
Maladie de Recklinghausen
Giant cell reparative granuloma.

=	synonym
E. P. =	used for, for partial synonym
T. E. =	narrower term

Fig. 2. Extract of a synoptic table: benign bone tumours.

```
   TL SYNDROME PARANEOPLASIQUE
   ALL BAMBERGER-MARIE-SYNDROM
   ANG OSTEOARTHROPATHY HYPERTROPHIC PULMONARY
OSTEOBLASTE
   TL TISSU CONJONCTIF
   ALL OSTEOBLAST
   ANG OSTEOBLAST
OSTEOBLASTOME BENIN
   EP FIBROME OSTEOGENIQUE
   EP OSTEOFIBROME
   EP OSTEOME OSTEOIDE BENIN
   EP OSTEOME OSTEOIDE GEANT
   ALL OSTEOBLASTOM (GUTARTIG)
   ANG OSTEOBLASTOMA (BENIGN)
OSTEOCHONDROMATOSE
   EMPL OSTEOCHONDROME
OSTEOCHONDROME
   EP EXOSTOSE OSTEOCARTILAGINEUSE
   EP OSTEOCHONDROMATOSE
   TE MALADIE EXOSTOSANTE
   ALL OSTEOCHONDROM
   ANG OSTEOCHONDROMA
OSTEOCLASTOME
   EMPL OS (T.A CELLULES GEANTES)
OSTEOFIBROME
   EMPL OSTEOBLASTOME BENIN
OSTEOGENESE
   ALL OSTEOGENESE
   ANG OSTEOGENESIS
OSTEOGENIQUE (MALADIE)
   EMPL EXOSTOSANTE (MALADIE)
OSTEOLYSE
   ALL OSTEOLYSE
   ANG OSTEOLYSIS
OSTEOME
   NEOFORMATION OSSEUSE DANS CRANE ET SINUS
   ALL OSTEOM
   ANG OSTEOMA
OSTEOME OSTEOIDE
   EMPL OSTEOBLASTOME BENIN
OSTEOME OSTEOIDE GEANT
   EMPL OSTEOBLASTOME (BENIN)
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Fig. 3. Extract of the thesaurus.

sicians, it has the advantage over classical systems of being constantly up to date in international literature. Being up to date consists of recognizing the implicit systematic nature of reports previously unrecorded or observed only in a cursory manner.

While document analysis consists of recognition and expression of precise concepts, the method of presentation of the semantic organization employed at this stage is that of *synoptic tables* of the various semantic fields. These tables gather concepts pertaining to the same field in the same way as the explicit references of the various levels which they set out (Fig. 1). The notions which have led to the gathering of the concepts are not necessarily those of the descriptors of the dictionary. So, in Fig. 2, benign tumours of the bone are grouped in terms of their histological origin, but the statement of this origin is not apparent in the thesaurus. Moreover, the essentially histological organization does not rely on the concepts of the hierarchy and, therefore, when one takes the structure of the thesaurus into account, cannot be produced by laymen. These tables thus provide a synoptic view of several ways of organizing concepts which relate to the same semantic field.

The *thesaurus*, the sum of the lexical and semantic parts of the documentary language, characterizes the hierarchical and environmental relationships of each concept. It presents these concepts in alphabetical order, associates each in detail with its scientific relatives, and allows better choice at the delicate level of terminology (Fig. 3). Its role being to enlarge the appeal of the preferred concept, utilization

Fig. 4. Extract of the index to the bibliographic review.

```
*INDEX MATIERES*                                                         -PAGE:032-

....................................POUMON (T) * CHIRURGIE *   OPERABILITE * PRONOSTIC * FONCTIONNELLE (EPREUVE) * .........  004891
UROGRAPHIE * VOIE I.-VEINEUSE * TOMOGRAPHIE * ANGIOGRAPHIE *   OPERABILITE * ...............................................  004924
 * DIAGNOSTIC * T.MALIGNE * DIAGN.DIFFERENTIEL * T.BENIGNE *   OPERABILITE * ...............................................  004952

GE * DELAI 1ER SYMPTOME - CONSULTATION * STADE * CHIRURGIE *   OPERATOIRE (MORTALITE) * MORT (CAUSE DE LA) * SURVIE A 5 ANS   004840
SSIE (T) * CYSTECTOMIE * PLASTIE * INTESTIN GRELE * GREFFE *   OPERATOIRE (MORTALITE) * SURVIE A 5 ANS * SURVIE AU DELA DE 5  004897
OMIE * GANGL.MAMMAIRES INT.(T.SEC.) * ANATOMIE * TECHNIQUE *   OPERATOIRE (MORTALITE) * THERAPEUTIQUES (COMPLICATIONS) * ...  004934
CE * ARTERIOGRAPHIE * SCINTIGRAPHIE * ANATOMIE * TECHNIQUE *   OPERATOIRE (MORTALITE) * ....................................  004855
DIAGN.PRE-OPERATOIRE * DIAGN.CLINIQUE * DIAGN.RADIOLOGIQUE *   OPERATOIRE (MORTALITE) * ....................................  004858
 * THERAPEUTIQUES (COMPLICATIONS) * PRONOSTIC HISTOLOGIQUE *   OPERATOIRE (MORTALITE) * ....................................  004908
ION * SURVIE A 5 ANS * SURVIE AU DELA DE 5 ANS * CHIRURGIE *   OPERATOIRE (MORTALITE) * ....................................  004919

   ..........SEIN (T) * OS (T.SEC.) * FRACTURE SPONTANEE *   OPERATOIRE (TECHNIQUE) * CHIRURGIE * THERAPEUTIQUE (ASSOCIATI  004935
   ...........GLOMUS CAROTIDIEN (T) * CHIRURGIE RADICALE *   OPERATOIRE (TECHNIQUE) * CIRCULATION SANGUINE * ............  004786
   ..........................VESSIE (T) * CHIRURGIE *   OPERATOIRE (TECHNIQUE) * CYSTECTOMIE * SURVIE A 5 ANS * THERA  004908
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  * SINUS MAXILLAIRE (T) * CHIRURGIE * CHIRURGIE RADICALE *   OPERATOIRE (TECHNIQUE) * ...................................  004813
  (T.SEC.) * LYMPHADENECTOMIE * RECIDIVE * SURVIE A 5 ANS *   OPERATOIRE (TECHNIQUE) * ...................................  005029

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QUE (T) * POUMON (T) * PROSTATE (T) * IODE 125 * RADON 222 *   OR 198 * TECHNIQUE * APPAREILLAGE * DOSIMETRIE * ...........  004728
.......RADIOTHERAPIE * COBALT 60 * RADIOTH.INTERSTITIELLE *   OR 198 * VOIE I.-PERITONEALE * RADIOBIOLOGIE * SANG * LIPIDES  004734

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.........POUMON (T) * RADIOTHERAPIE * DOSIMETRIE * CALCUL *   ORDINATEUR * DOSE * ........................................  004724
ADIOTHERAPIE * CHAMPS * DOSIMETRIE * COBALT 60 * TECHNIQUE *   ORDINATEUR * ...............................................  004732

..................................................LEUCEMIE *   OREILLE (T) * HISTOPATHOLOGIE * ..........................  005097
...........................................................   OREILLE (T) * PEAU (T) * EPITHELIOMA BASOCELLULAIRE * TRAITEM  004782

...........................................................   OREILLE MOY.(T) * MASTOIDE (T) * GLOMUS JUGULAIRE (T) * CHEMO  004808
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E ENERGIE * RADIOTH.INTERSTITIELLE * RADIOTH.ENDOCAVITAIRE *   ORGANISATION * ENSEIGNEMENT * RECHERCHE SCIENTIFIQUE * ......  004736
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 CCALE (T) * RADIOTHERAPIE * THERAPEUTIQUES (COMPLICATIONS) *   OS * PREVENTION * CHIRURGIE * RADIONECROSE * ...............  004810

 E * DIAGN.HISTOLOGIQUE * T.MULTIPLE * ORGANE ODONTOIDE (T) *   OS (DYSPLASIE FIBREUSE) * CEMENTOME * ......................  004788
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becomes apparent at the stage of question formulation, that is to say, the choice of the principles of selection is based on the document store. Synoptic tables representing semantic fields, by placing each concept in the centre of all its possible relations with others, and the thesaurus are complementary instruments.

The *formulation of questions* is based on Boolean logic, utilizing some intersections and a great many modulations of the sum of that logic. The documents thus selected are subjected to human control, which allows the elimination of false associations of descriptors and eventual reformulation of the question, with greater or fewer details, in such a way as to best fit the needs expressed by the applicant: the bibliographic study, exhaustive or not, of a subject; the resolution of a technical problem; the collection of single reviews discussing a subject; etc.

The system described here is operative and handles 20,000 documents per year. The document store is obviously used to answer retrospective, among other, questions. Likewise, recently analysed documents are available for selective dissemination and for publication in a bibliographic review. This review is published by the Scientific Documentation Service of the Gustave-Roussy Institute, and is original in containing a table of contents which consists of a permutation (as in KWIC indexes) not of title words, but of normalized descriptors. This table of contents thus combines the advantages of the choice of significant concepts and of the standardization of their manner of expression in context, thus presenting the possibility of associations suitable for KWIC indexing (Fig. 4). Let us note in passing that only the descriptors which constitute probable lines of bibliographic access appear in the centre of the permutation.

The close co-operation between information and biomedical specialists has allowed the construction of an automatic information system for the use of medical information in the field of carcinology.

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Fig. 4. Extract of the index to the bibliographic review.

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IX

serials record control system on computer

K. Urata, A. Nozoe and H. Ogawa

The SRCC system (Serials Record Control system on Computer) is a mechanized system of serial records which is projected at Kitasato Memorial Medical Library, School of Medicine, Keio University, under contract with Toshiba Co., a Japanese computer manufacturer. This system was planned in April 1967 to introduce a library automation system into Japan.

In designing our system, we studied some existing systems in the U.S.A., for example, those of the Washington University School of Medicine, UCLA, and the University of Illinois; however, we paid special attention to the situation which is unique to Japan. With this basic attitude we set up the following two purposes: first, to work out a mechanized system of serial records and examine the problems involved in it, and second, to train a computer-librarian. Solely for the latter purpose, we were first trained in programming for a six-month period. The aims of this system are the mechanization of the following activities: holding process, claiming control, binding process, and accounting. At present, our library holds approximately 4,500 titles, including 650 current domestic and 1,250 current foreign titles, and receives about 50 titles daily.

special characteristics of the srcc system

Our purposes for developing the SRCC system were to develop mechanization of all work related to handling of serial records, and also to design it in such a way that it would be applicable to any organization. The computer used is TOSBAC-5400 Model 30 (32K), and we employ Assembly language. As input medium we use punched cards, and data are recorded on magnetic tape.

binary representation of holding record

In this system, 1 binary digit (hereafter abbreviated as 'bit') is used to represent 1 issue of a journal, *e.g.*, '1' for holding and '0' for non-holding. For updating, '0' is automatically converted to '1'. By means of this, it is much easier to control each process, such as updating of holdings, claiming control, and binding notice. Furthermore, it can also prepare a *want list*, which comprehensively lists lacking issues of journals in the entire collection. For the binding process, bound volume is indicated by '1' and unbound by '0'.

frequency table

The publication pattern of journals gives difficulty in automatic output of check-in cards for issues which are expected to come in next (the NIC card). In SRCC, four basic data elements are provided for publication pattern: frequency-1, number of issue per volume; frequency-2, number of volumes per year; frequency-3, initial month of each volume number; and frequency-4, continuous number of issues independent of

A. Data of Master Record

FREQUENCY REFERENCE

TABLE	ISSUE
1	36
2	32

FREQUENCY TABLE

TABLE NO	FREQ 1	FREQ 2	FREQ 3	FREQ 4
1	12	1	1	0
2	4	1	1	0

BOUND or UNBOUND

1101000000....

INITIAL YEAR

1960

INITIAL VOLUME

1

CEASED EDITION INDICATOR

+

HOLDING RECORD

111111111111111111111111000000000000111100001100

V. 1-2 V.3(lack) V.4 V.5 V.6

B. Output

B1-2(1960-1961).B4(1963).U6N1-2(1965)+

C. When next new issue Vol.6 No.3 comes

1111111111111111111111110000000000001111000011100

Vol.6 No.3

Fig. 1. Example of processing of SRCC holding record.

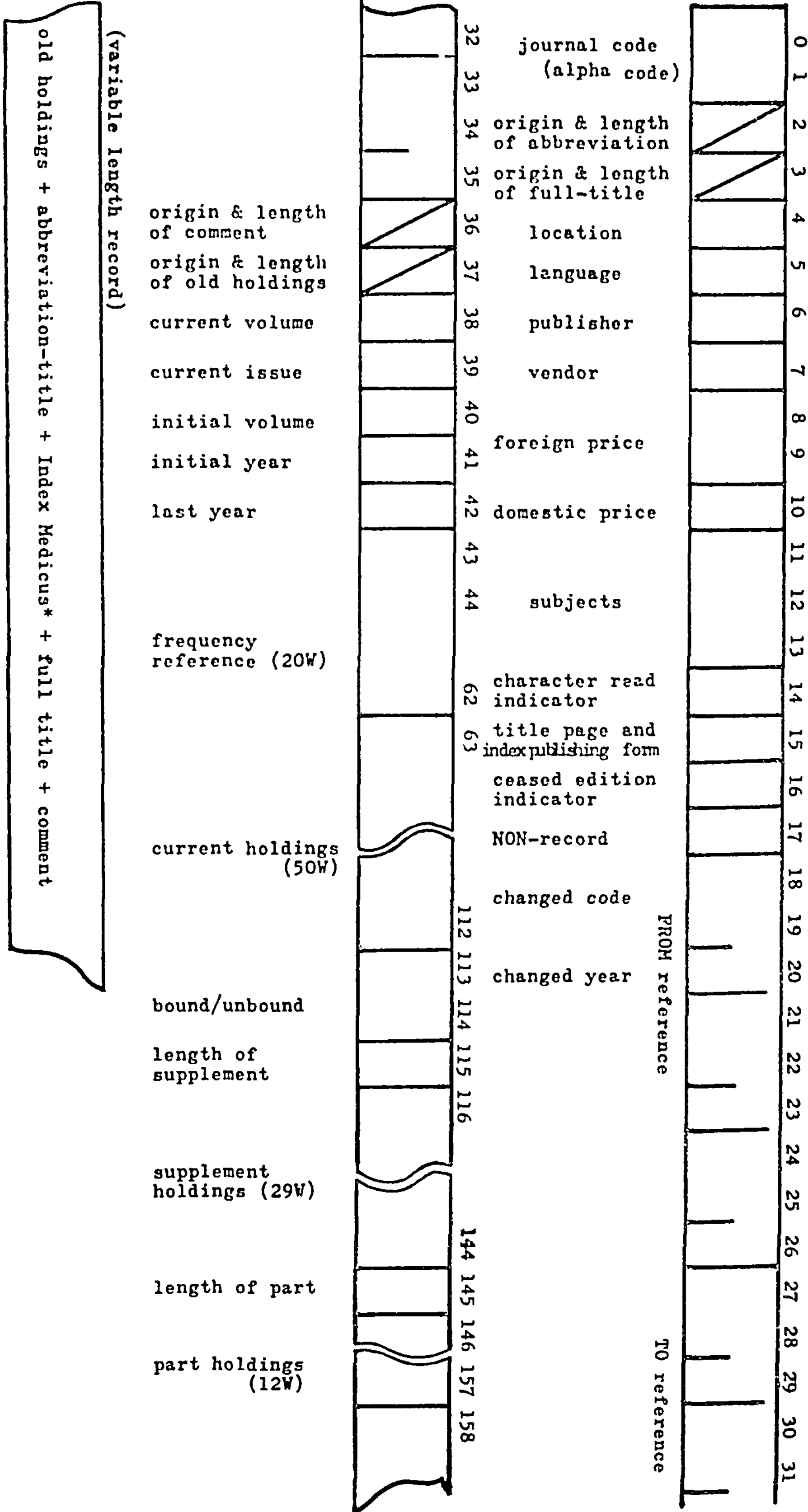


Fig. 2. SRCC system master tape format.

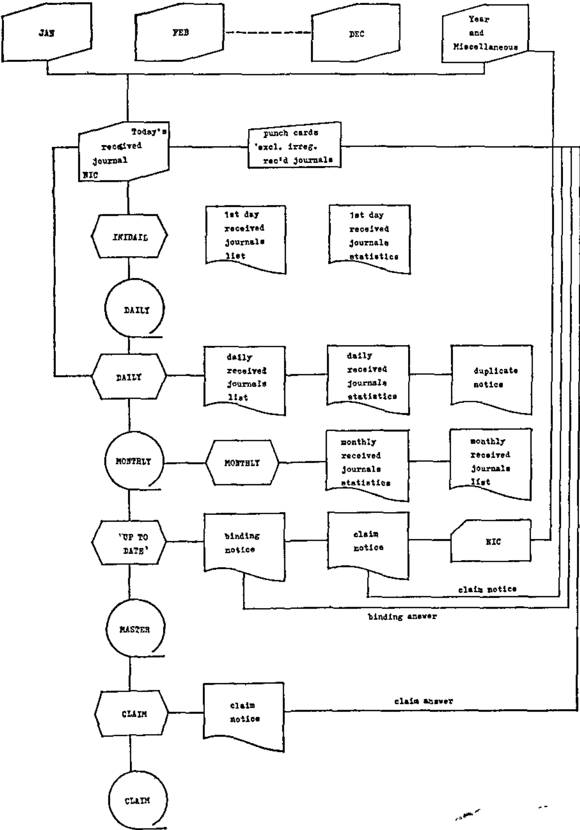


Fig. 3. Flow diagram.

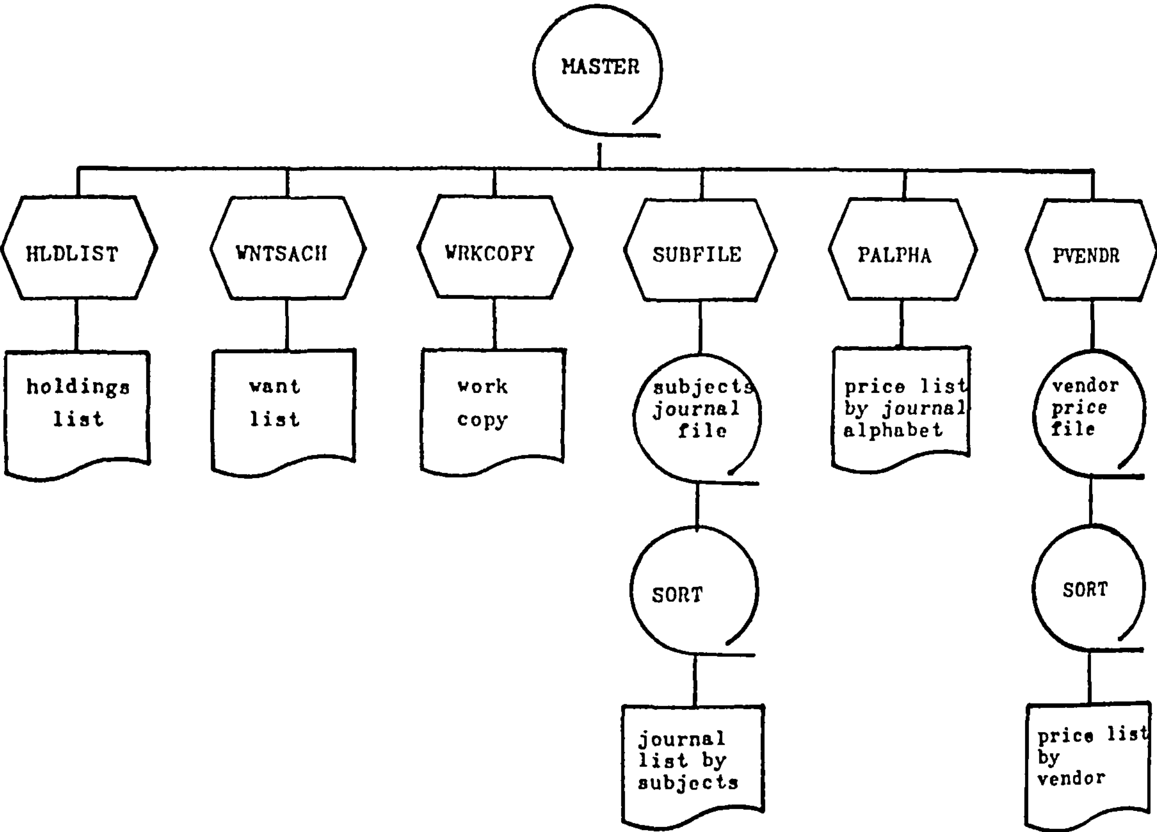


Fig. 4. SRCC list production.

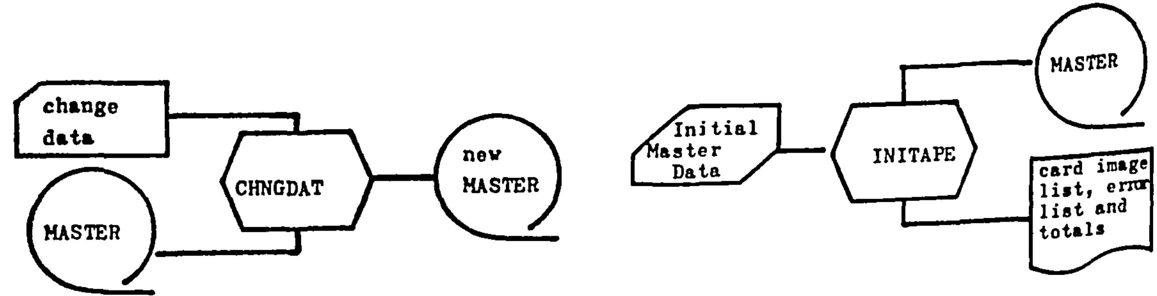


Fig. 5. SRCC data change.

Fig. 6. SRCC make-master tape work.

volume or other numbering. This makes it possible to control any pattern of publication, even the change of publication frequency of a journal.

frequency reference

This is to control the frequency table, and by means of these two, the computer generates the NIC card, that is, the check-in card. Some journals, however, have publication patterns for which the use of the bit system is not necessarily justified. Therefore, the system is designed to make it also possible to record the data by character. According to the type of publication, the users of the system decide whether they use bit or character. Figures 1-6 show the main processes of the SRCC system.

outputs of the SRCC system

Daily accession and statistical lists are obtained by feeding the NIC card into the computer. The records in this *daily accession list* include journal code, abbreviated title, volume number, issue number, month of publication, year of publication, supplement, and title change notice. The *statistical list* records total number of issues accessioned, difference of domestic or foreign titles, means of accession, new titles, etc.

Monthly cumulation of the daily lists records monthly acquisition and other statistical data. The *holding list* is prepared from the master tape, which is updated by the monthly list and is available whenever necessary. The *holding list* keeps the latest data on journal code, journal title, abbreviation of title, title change, and *holding records (bound or unbound volume, ceased publication, standing order, see* reference, and other notes).

Two kinds of *claim notice* can be prepared in this system. In updating the master record, the computer checks whether or not the last issue of a journal is accessioned, and if not, it prepares a *claim notice* which lists the date on which checking is done, journal code, abbreviation of title, volume and issue number, and vendor's name. It can also check periodically to find those which have not come into the library and prepare claim notices for them. Our system is supposed to be the first to mechanize this part of the process which in other existing systems is still done manually.

The *bind notice* is prepared when the last issue of a volume is recorded when the master tape is updated. The records given are journal code, abbreviation of title, bound volume number, unaccessioned issue number, if any, and information on title page and index.

The *subject list* lists the journals according to their subjects. Each journal is given a maximum of three subject headings from MeSH of *Index Medicus*. The data consists of subject codes, journal code, and abbreviated journal title.

While the *claim notice* aims at the current control of unaccessioned issues, the *want list* records all the lacking issues of the entire holding, whether they are missing, unaccessioned, or lacking for other reasons. The information given includes journal code, abbreviation of title, lacking volume and issue numbers, year of publication, and the date on which the list is prepared.

Two *price lists* are provided by the system. First, the price list *by journal* lists the price of each journal currently accessioned. It is arranged alphabetically by j ... title, with information on journal code, abbreviated title, subscription price, ...

price, and vendor's name. Second, the price list *by vendor*, in alphabetical arrangement by vendor's name, provides the same information as the price list by journal. In addition, however, total price of all journals ordered from each vendor can be obtained.

The *work copy* includes all the data on the master tape on the journals in the library. With this, system workers can check whether or not input of the data is made correctly, and acquisition librarians can obtain various information on journals. The records stored on the master tape are available in outputs other than the mentioned forms.

4

bibliography

citation indexing, historio-bibliography, and the sociology of science

E. Garfield

It is indeed an honor to have been asked by the Scientific Committee to replace my friend and colleague, Professor Derek de Solla Price, as the speaker on this occasion. I gladly accepted the challenge, but I cannot provide his unique blend of wit, humor, and scholarship. Both Professor Price and Professor Robert K. Merton serve on the Advisory Board of the *Science Citation Index* as representatives of the 'Scientists of Science' — the name for a new breed of sociometrist concerned with the historical, sociological, economic, and behavioral study of science and scientists.

In contrast to Price who has 'turned' from history to bibliography, or Merton who has similarly 'turned' from sociology to find gold in the hills of bibliotopia, I am the bibliographer turned historiographer and sociometrist. I, therefore, will not display the 'traditional' scholarship of the medical historian who has painstakingly examined each and every relevant ancient manuscript pertinent to his chosen field.

Indeed, my objective is to show that so-called traditional scholarship is an exercise that is 80% drudgery and 20% intellectuality. To write history, today as in the past, one must be capable of martyr-like perseverance. It is a back-breaking chore to identify and obtain suitable library materials. One of my library professors at Columbia University once said that the availability of a comprehensive citation index would probably abort 90% of the dissertations in the humanities and social sciences. My purpose is to show that he was correct to the extent that many dissertations are awarded as a sign of completing the monastic sentence of years of toil in the stacks of libraries.

When I agreed to speak, I wrote the Secretary-General that I would use the occasion to report to the medical library profession certain basic ideas I had first reported three years ago at the Symposium on the Foundations of Access to Knowledge (Garfield, 1968) in a paper entitled '"World Brain" or "Memex?" Mechanical and intellectual requirements for universal bibliographic control'. In spite of the essential novelty of these ideas for most of you, I could not, however, in clear conscience merely paraphrase or parrot material that is three years old. This would be disrespectful to the importance of such an international conclave. I will, therefore, limit my initial remarks to a brief presentation of the basic notions involved in comparing primordial citations, subject indexing, and historio-bibliography. I will then present some interesting new data generated since my first public discussion of primordial citations. Not the least of this is a list of the 50 most frequently cited journal articles and a recently compiled history of DNA updated since I first reported the history of the genetic code using citation analysis (Garfield *et al.*, 1964).

The appearance of the first 'experimental' *Science Citation Index* in 1963 created a mild furor in the literature. Not all the reviews were unfriendly: Professor Steinbach (1964), using a group of graduate students to help him review the *SCI*, said in *Science*:

> *Any real evaluation of* Science Citation Index *must be based on an extensive use test, and there has not been time for that. Most of us are accustomed to literature searches*

that begin with a subject. This, of course, presents real problems if one wishes complete coverage of the subject, because subject matter indexes are no better than the choice of words indexed. However, we are used to them — like an old shoe, they are comfortable.

On the other hand, a number of so-called reviews were in fact emotional and fearful responses to something quite different on the bibliographical scene — like a pair of new shoes. Most scientists and librarians, although working together on the frontiers of knowledge, are basically conservative. They are, after all, only human — and so am I. I can justify my own immodesty by referring to Professor Merton's recent AAAS paper (1969) in which he states that a scientist need not hide his vanity because it is quite healthy. The negative acclaim the *SCI* received by experts such as Cleverdon (1964) only convinced me that the *SCI* would be recognized as a milestone in medical and scientific bibliography. Like the savants of the last century who proved that airplanes could not fly, citation indexes *should* not work. But they do! This is not to say that there is not plenty of room for improvement. I find it hard to predict what the supersonic version will be. Possibly the major contribution of the *SCI* is that it contains a truly up-to-date calendar year author index — the *Source Index*. The *Source Index* is valuable not only in the process of citation verification and search by author, but will eventually become the means for correcting thousands of author-introduced citation errors that plague librarians every day.

A major semantic difficulty in discussing library systems is caused by the practice among librarians and others, particularly physicians and engineers, of lumping together two distinct problems of information retrieval — *information recovery* and *information discovery* (Garfield, 1966). Most scientists use author catalogs to find books they know exist. This I call information recovery. In this sense, the English word 'retrieval' is similar to the French word *retrouver* 'to find again'. Scientists rarely use subject catalogs to *recover* books. Many librarians have, therefore, justifiably asked why we spend so much money creating them (Gore, 1966). On the other hand, it is known that scientists do make use of periodical indexes. Subject indexes facilitate the process of information discovery — finding what is not known at the outset to exist. When the *Science Citation Index* entered the bibliographic scene, it added another means for accelerating information discovery. It is no surprise that the *SCI* appealed, at first, primarily to the adventuresome scholar who uses all sorts of serendipitous devices (Lederberg, 1959; Smith, 1964; Stonehill, 1965). This type of man is usually glad to discover the unexpected.

At first the librarian found *SCI* somewhat alien. Not only does a page of the *Citation Index* look strange (it could not have been otherwise), but the results of a search often seem equally strange. One cannot evaluate the results of many *SCI* discovery searches in exactly the same way that one can evaluate the traditional tool for information recovery. In retrospect, therefore, it is equally understandable that one of the major uses by librarians of the *Citation Index*, for which it was not designed, is citation verification. The intuition of the medical librarian on this is justified. In the seven years for which we now have citation indexes, an incredibly large percentage of the *entire* medical literature has been cited. There is a high but varying probability that, depending upon the year in which the paper was published, the citation one is at-

tempting to verify will be found in the *SCI*. Of 2,000,000 items cited in 1968 *alone*, about 25% or half a million were published in 1966 and 1967. This would account for a very substantial percentage of the items indexed in *Index Medicus*, *Chemical Abstracts*, *Biological Abstracts*, and *Excerpta Medica* combined. More importantly, *it is as a tool for information discovery that the Citation Index* section of the *SCI* must be evaluated. Regrettably, we do not have any established criteria for such measurement. Just as beauty is said to be in the eyes of the beholder, relevance is a quite subjective variable for the bibliographic explorer. What is relevant to one investigator is irrelevant to another.

One can develop methods for studying the overall retrieval effectiveness of the *SCI* and other indexes in well-defined search topics. For an extensive literature search on Thalidomide, Spencer (1967) compared the time of search with *SCI* to *Chemical Abstracts* and *Index Medicus*. Though favorable to *SCI*, such studies, however, have not revealed *why* the *SCI*, depending upon the circumstances, may or may not be very effective at all. Of course, we can conduct user evaluations in which users express general satisfaction or dissatisfaction, but this does not necessarily help us understand the fundamental conceptual problem of subject analysis.

To understand what is being retrieved in an *SCI* search, we have to recognize the underlying concept which is merely symbolized by a bibliographic citation. As librarians, our traditional concept of a 'subject' is so ingrained that we fail to realize that a word is merely a symbol for a concept. Chemists fall into the same trap and often forget that a chemical formula is only symbolic of the 'real' thing Words, formulas, and citations are approximations. Furthermore, semanticists know that no two occurrences of the same word or symbol are identical. A subject heading or a key word functions as an approximation which is usually about one order of magnitude less specific than the approximation made by using a bibliographic citation as an indexing term. Citation indexing is not only 'in-depth' indexing as contrasted to the 'in-breadth' indexing of permuterm indexes, but the type of unique specificity the citation index provides is, at times, alarming to the traditional searcher. Indeed, a completely negative result in searching the indexes for current references to a particular paper or book may be exactly what the user expects or wants. Unfortunately, we have no standard of comparison for evaluating indexing systems in this respect.

To evaluate the specificity of citation indexing, one must translate a citation search question from the language of the citation index into the language of the word index. This is not easy, but when the attempt is made one recognizes that, as an indexing language, citation indexing also exhibits the characteristics of other indexing languages. For example, the *see* references and *see also* references contained in a typical controlled thesaurus can also be incorporated into citation indexes. As we will see later, in order to bridge the gap between the two indexing languages, I developed the concept of the primordial term — including primordial citations and primordial words.

One might ask why the term 'key citation', by analogy to 'key word', was not chosen. When I first used the noun phrase 'primordial citation' (Garfield, 1968), it was my intention that we design a dictionary of key citations. The dictionary would enable the librarian or student to make the transition from the symbolism of words

RANK	TOTAL TIMES CITED	AUTHOR	JOURNAL	VOL	PAGE	YEAR
1	2353	LOWRY OH	J BIOL CHEM	193	265	51
2	654	REYNOLDS ES	J CELL BIOL	17	208	63
3	641	LUFT JH	J BIOPHYS BIOCHEM CY	9	409	61
4	516	FISKE CH	J BIOL CHEM	66	375	25
5	457	FOLCH J	J BIOL CHEM	226	497	57
6	456	BRAY GA	ANAL BIOCHEM	1	279	60
7	309	SABATINI DD	J CELL BIOL	17	19	63
8	301	SPACKMAN DH	ANAL CHEM	30	1190	58
9	304	GORNALL AG	J BIOL CHEM	177	751	49
10	331	LINEWEAVER H	J AMER CHEM SOC	56	658	34
11	285	BURTON K	BIOCHEM J	62	315	56
12	275	DUNCAN DB	BIOMETRICS	11	1	55
13	274	SCHEIDEGGER JJ	INT ARCH ALLERGY APP	7	103	55
14	241	DOLE VP	J CLIN INVEST	35	150	56
15	225	DAVIS BJ	ANN NY ACAD SCI	121	404	64
16	223	NELSON N	J BIOL CHEM	153	375	44
17	223	REED LJ	AMER J HYG	27	493	38
18	218	MOORHEAD PS	EXP CELL RES	20	613	60
19	217	MARMUR J	J MOL BIOL	3	208	61
20	207	JACOB F	J MOL BIOL	3	318	61
21	203	WATSON ML	J BIOPHYS BIOCHEM CY	4	475	58
22	197	PALADE GE	J EXP MED	95	285	52
23	187	KARNOVSKY MJ	J BIOPHYS BIOCHEM CY	11	729	61
24	182	MARTIN RG	J BIOL CHEM	236	1372	61
25	175	SMITHIES O	BIOCHEM J	61	629	55
26	163	BARTLETT GR	J BIOL CHEM	234	466	59
27	162	BARKER SB	J BIOL CHEM	138	535	41
28	160	EAGLE H	SCIENCE	130	432	59
29	158	ROSENFELD AH	REV MOD PHYS	39	1	67
30	156	GELLMANN M	PHYS REV	125	1067	62
31	153	TREVELYAN WE	NATURE LOND	166	444	50
32	140	WARREN L	J BIOL CHEM	234	1971	59
33	140	ANDREWS P	BIOCHEM J	91	222	64
34	139	MONOD J	J MOL BIOL	12	88	65
35	136	SCHMIDT G	J BIOL CHEM	161	83	45
36	134	BARDEEN J	PHYS REV	108	1175	57
37	134	DEDUVE C	BIOCHEM J	60	604	55
38	131	KARPLUS M	J CHEM PHYS	30	11	59
39	131	AHLQUIST RP	AM J PHYSIOL	153	586	48
40	130	DUBOIS M	ANAL CHEM	28	350	56
41	128	ELLMAN GL	ARCH BIOCHEM BIOPHYS	82	70	59
42	125	WARBURG O	BIOCHEM Z	310	384	41
43	125	GELLMANN M	PHYSICS	1	63	64
44	124	MANDELL JD	ANAL BIOCHEM	1	66	60
45	123	DOLE VP	J BIOL CHEM	235	2595	60
46	122	LITCHFIELD JT	J PHARMAC EXP THER	96	99	49
47	122	MILLONIG G	J APPL PHYSICS	32	1637	61
48	119	FRIEDEMANN TE	J BIOL CHEM	147	415	43
49	119	MOORE S	J BIOL CHEM	211	907	54
50	119	JAFFE HH	CHEM REV	53	191	53

Fig. 1. Fifty most cited articles for 1967, ranked according to total times cited. (Refer to Appe dix A)

to the symbolism of citations. Ordinarily, the subject expert does not require th assistance. The dictionary of key citations, however, soon became the *dictionary primordial citations* for several reasons which are discussed below. But first I wish note that a major portion of the work on this dictionary has now been completed as v have thus far compiled lists of the 20,000 most frequently cited papers for a five-ye period. In Fig. 1, I have provided the list of 50 papers most frequently cited in th scientific literature during 1967. (See Appendix A for the titles of these papers Although I will not comment in detail on each paper, I do want to point out th many of these particular papers are methodological. In retrospect, one *expects* th such method papers will be frequently cited, but it comes as a surprise that the predominate so strongly. Furthermore, the *age* of these papers is even more dramati illustrating how today's research still depends upon methods and theories develope in previous generations. While examining the list of 'super-classics', as Profess Price (1965) would call them, one notices that the theoretical and other fundament discovery papers also appear on the list. As we will see later, papers like these can b identified with the key events in the history of science or medicine. The predominan of biologically-oriented papers in contrast to those in the physical sciences is, c course, not a measure of the relative 'importance', social or otherwise, of molecul biology as contrasted to solid state physics. It probably simply reflects the quantitati differences in and character of publication in these areas.

But why is it not possible to construct a dictionary of *key* citations? Why dictionary of *primordial* citations? We can, of course, in many cases associate a ke

word with a key paper. The neologism 'euphenics', first used by Lederberg in 1963, can, of course, be used as a cross-reference to that paper. The underlying *concept* of euphenics, however, was known long before that time.

Many primordial citations identify key medical discoveries although, at the time of the discovery, an appropriate nomenclature was not even available. Consider the classical case of diabetes and the discovery of insulin by Banting and Best (Fig. 2).

A. Banting, F. G. and Best, C. H. (1922), Pancreatic extracts. *J. Lab. clin. Med.*, 7, 464.
B. Banting, F. G. (1925), Nobel Prize Lecture.
C. Banting, F. G., Best, C. H. and MacLeod, J. J. R. (1922), The internal secretion of the pancreas. *Amer. J. Physiol.*, 59, 479.
D. Banting, F. G. and Best, C. H. (1922), The internal secretion of the pancreas. *J. Lab. clin. Med.*, 7, 251.
E. Banting, F. G., Best, C. H., Collip, J. B., MacLeod, J. J. R. and Noble, E. C. (1922), The effect of pancreatic extract (insulin) on normal rabbits. *Amer. J. Physiol.*, 62, 162.
F. Banting, F. G., Best, C. H., Collip, J. B., MacLeod, J. J. R. and Noble, E. C. (1922), The [illegible]
G. [illegible]
H. Schmidt, J. E. (1959), *Medical Discoveries (Who and When)*, p. 237. Thomas, Springfield, Ill.
I. Skinner, H. A. (1961), *The Origin of Medical Terms*, p. 228. Williams and Wilkins, Baltimore.
J. DeMeyer, J. (1908), Glycolyse, hyperglycemic, glycosuric et diabete. *J. Méd. Brux.*, 13, 778.
K. Best, C. H. (1960), Epochs in the history of diabetes. In: R. H. Williams (Ed), *Diabetes*, p. 1. Harper and Row, New York.
L. Best, C. H. (1963), In: C. H. Best (Ed) *Selected Papers of Charles H. Best*. Univ. of Toronto Press, Toronto.

Fig. 2. Bibliography on insulin (Banting and Best).

The association between diabetes mellitus and pancreatic defect was known for nearly 30 years prior to the discovery of insulin. In a historical review (A), Banting and Best refer to an early success by George Ludwig Zuelzer, a German physician who isolated a crude pancreatic extract in 1908. This Zuelzer used to treat diabetes in several patients and some improvement was noted. Unpredictable side reactions and failure by others led to abandonment of this treatment. Until then diabetic control had been limited to carbohydrate deprivation. The dietetic approach eventually produced starvation, overwhelming infection, coma, and death. As shown in Fig. 2, the first hint of their historic discovery, according to Banting's Nobel Prize lecture (B), appears in the December 1921 *Proceedings of the American Physiological Society*. This report was later abstracted and expanded in two journal articles in 1922 (C, D) under the title 'Internal secretion of the pancreas'. The word 'insulin' was not used. In another research paper (E) which followed, however, the word 'insulin' does appear in the title but in parenthesis after the expression 'pancreatic extract'. In a research paper subsequently published (F), the word 'insulin' is used and 'pancreatic extract' is omitted.

Banting and Best do not give their reason for coining the word. The point I wish to stress is that the first case report of the clinical use of insulin which is often cited as a classic (G) did *not* contain the word 'insulin'.*

'Insulin' first appears as a main index word in the 1923 2nd Quarter *Index Medicus*.

* In extensively reviewing medical histories, Best's memoirs, etc. (K, L), my colleague, Dr.

Gene Joslin mentions a 1921 notebook of Best in which the word 'isletin' is used and that Banting and Best used the word 'insulin' orally two months after publication of the classical 1922 paper published in the *Canadian Medical Association Journal.*

The important point I am trying to stress in this typical example of what structural linguists call the process of *analogous linguistic change* is that primordial citations must be distinguished from primordial words. Only an *a posteriori* intellectual effort can clearly identify what might then be called a 'key' citation. For any student who wants a quick identification of the classical paper on the clinical use of insulin mentioned above, *The Dictionary of Primordial Citations* will be extremely useful. The reverse may also be true. The paper or book with which a concept may become identified may appear many years after the term is in vogue or being heavily used. In fact, many times no clearly identifiable citation is associated with the word. As any etymologist knows, to identify the first occurrence of a word or phrase is no small task; and each particular subsequent use, whether in lay usage or in scientific usage, is only a shade different than the previous use.

To amplify the difficulties in correlating complex concepts with traditionally word-structured indexing languages, consider the concept 'protein determination by the Folin phenol reagent', sometimes referred to as the 'Lowry method'. In Fig. 1, we saw that this was first reported in 1951 and the paper is the most frequently cited work in the 1967 literature. No term for it exists in the *Medical Subject Headings List* (MeSH) of *Index Medicus.* The symbol **Lowry 1951 JBC,** however, adequately identifies the concept. The symbol **Lowry 1951, JBC vol. 193, p. 265** also identifies its exact address! Unquestionably, *Index Medicus* does provide for indexing papers on protein determination methods, but that is a vastly more generic concept than the Lowry method or derivates thereof.

Perhaps this does not seem particularly important in a medical index, but does it seem unreasonable that a researcher might ask for papers in which the Lowry method has been employed in cancer research? From the number of papers on this topic alone, one must conclude that the depth of indexing this implies is necessary, and further, we must find ways to bridge the gap between citation indexes and word indexes. *The Dictionary of Primordial Citations* can help resolve some of these problems, but must be limited to those citations which by definition have become classics. We can only hope to develop the word synonyms or equivalents for each of about 20,000 of the most frequently cited papers each year – about 1% of all the papers that are cited. Should we attempt to establish key or primordial citations for those older words or word phrases which occur most frequently? Clearly, this is an entirely

Richard Torpie of Hahnemann Medical College was unable to find mention of the decision to use the word 'insulin'. Schmidt (H), however, ascribes to Jean de Meyer, a French physiologist, the term *insuline*, *circa* 1909. Skinner (I) reminds us that the word 'insulin' is a derivative of the Latin *insula* 'island'. Of course, the active ingredient is derived from the Islands or Islets of Langerhans of the pancreas. De Meyer states that it was Schaefer who presupposed in 1913 that the Islands of Langerhans were responsible for the active principle long before the extract was obtained. Banting, Best, and MacLeod isolated the substance in Toronto in 1921 and used the name 'insulin' for their extract. We could not locate any article by Schaefer; de Meyer, however, did write on the subject of diabetes (J). Of significance, too, is the methodical citation by Banting and Best of Langerhans' discovery in all their early work.

different and possibly futile exercise. Frequency of word usage in scientific titles or traditional indexing languages is not going to provide a necessarily useful approach to the current literature. The historian would have great interest in knowing the primordial citations for words like 'cancer', 'liver', etc., but the searcher interested in some specialized aspect of cancer or liver research would not be aided significantly by such devices. In any case, extremely useful by-products can be obtained from large-scale word-frequency analyses. Before discussing these, let me cite a current example which illustrates why citation language is essential to current information retrieval.

Suppose that a physician comes to your library and requests current information on the 'Chinese Restaurant Syndrome'. This might seem like a jest, but in fact just last year it was discussed in the *New England Journal of Medicine* (Schaumburg *et al.*, 1968) and later in *Science* (Schaumburg *et al.*, 1969). The topic has also been discussed recently in the *New Scientist* under the dubious heading of 'Kwok's disease' (Chedd, 1969). These reference citations will continue to be useful citation index headings to help scientists retrieve information on this topic. But how will the medical librarian bridge the gap between the terms 'CRS' or 'Kwok's disease' and these primordial citations? We were acutely conscious of this gap between the indexing language of the citation index and the natural language of science when we introduced the concept of *permuterm indexing.*

The *Permuterm Subject Index* section of the *SCI*, which is still relatively unknown to many medical librarians, is based upon title words. *PSI* is obviously related to the Key-Word-in-Context (KWIC) index which has become so widely known through its use in *Biological Abstracts* and *Chemical Titles* (Luhn, 1959). Since KWIC and KWOC — or Key-Word-Out-of-Context index, not to be confused with Kwok's disease — are both title-derived, there are certain similarities between them and *PSI*. Their differences, however, are equally significant.

CONVENTIONAL PERMUTERM

BIRTH
  CONTROL
  GROWTH
  POPULATION
  RATE

CONTROL
  BIRTH
  GROWTH
  POPULATION
  RATE

GROWTH
  BIRTH
  CONTROL
  POPULATION
  RATE

POPULATION
  BIRTH
  CONTROL
  GROWTH
  RATE

RATE
  BIRTH
  CONTROL
  GROWTH
  POPULATION

MODIFIED PERMUTERM

BIRTH-CONTROL
  POPULATION-GROWTH
  BIRTH RATE

POPULATION-GROWTH
  BIRTH-CONTROL
  BIRTH RATE

BIRTH RATE
  POPULATION-CONTROL
  BIRTH-CONTROL

Fig. 3. Permuterm indexing of 'Control of population growth and birthrate'.

In the *Permuterm Index* every significant title word is *permuted*, not merely rotated as in KWIC, to produce all possible pairs of terms. Thus, approximately $n(n\text{-}1)$ term pairs are created by this procedure. In a title containing six significant words, thirty pairs are created; for five terms, twenty pairs are created.

In very recent work we have developed modified permuterm computer programs which automatically or algorithmically generate 'logical' subdivisions in an index. This approach, like our studies of citation frequency, is based on purely quantitative measures of word co-occurrences. These frequency analyses establish *semantically* useful word phrases and word pairs. Such analyses should not be confused with textual word-frequency studies. We have recently completed a statistical analysis of several million word and word-phrase occurrences for the 300,000 titles appearing in the 1967 *SCI Source Index*. These titles are the initial input for the *Permuterm Subject Index*.

It is important to observe that when one seeks information on a highly specific topic, it makes very little difference, except for *format* considerations, whether or not he uses a KWIC or a permuterm index. If only one or two articles are identified in any system, then one can quickly scan the article title. Most scientists *reject* KWIC indexes precisely on the grounds of format. Secondly, and more importantly, when one searches a subject for which there are dozens of articles, one needs subdivisions to narrow the search to a few pertinent items. This is largely achieved in the format of the *PSI*. But the pure permutation of significant title words does not contend with the peculiar word or noun-phrase constructions of the English language. This is sometimes aggravated by omission of punctuation marks. Thus, consider the importance of the comma in the sentence, 'Doctor X, while distilling alcohol, was consumed'. Contrast this to 'Doctor X, while distilling, consumed alcohol' and 'Doctor X consumed distilling alcohol'. 'Distilling' and 'distilling alcohol' are quite distinct semantic concepts and ideally one wishes to preserve such distinctions. In an index one may sacrifice such distinctions to increase overall retrieval effectiveness and indexing economy.

How exciting to find that, by large-scale statistical analysis, the frequency of such unwanted co-occurrences is limited to an extremely small number. If one establishes a minimum threshold of co-occurrence, then legitimate word phrases are identified. If two consecutive words occur in titles x or more times, then that word pair has been established as a legitimate word phrase. Thus, while 'distilling alcohol' might in fact occur only once or twice, *if* the sequence *did* occur ten times, it would prove to be a useful primary indexing term! This seemingly innocuous discovery has great significance for the efficient design of indexes, since we can now reduce the number of permutations while *increasing* retrieval speed and specificity.

Consider the indexing of 'Control of population growth and birthrate' (Fig. 3). Whereas a concept like 'birth control' would appear as two primary terms by pure and simple permutation, the procedure described above *automatically* indexes this title under **birth-control.** Unfortunately, the procedure is not all that simple because we do not wish to separate the term 'birth-control' from 'control-of-birth'. It is precisely with this in mind that one must perform the frequency analyses after the permutation process and then reassign the indexing terms once the appropriate word

pairs have been identified. This procedure resolves the problem of conjunctive phrases in which one finds expressions such as 'control of population growth and birth rate'. By the procedure I have just described, such an article will be indexed under **birth-control, birth-rate, population-growth**, etc., whereas previously, the primary terms would be **birth, control, growth, rate.** In other words, the computer first examines the twenty word pairs created by permutation and replaces the single-term entries by the hyphenated expressions once it is determined that the word pair occurs above a given threshold.

Fig. 3 shows the indexing terms which would result from the second procedure, depending upon the statistics one might find for a particular file of information. All high-frequency term pairs would be cross-referenced to the appropriate term since they now function as primary terms Thus, **control-growth** would be cross-referenced to **birth-control.** All such studies, of course, accentuate the advantages that may be derived from pre-edit and post-edit procedures by human editors who can perform the important indexing function of suppressing useless indexing entries. Using procedures of this kind, in the future, monitoring the changing literature of science and medicine will be possible by whatever quantitative criteria one wishes to select. One can establish useful word phrases without resorting to human editing procedures.

It is essential to keep in mind that the deliberate purpose of the *Permuterm Index*, and indeed most co-ordinate indexing systems, is to direct the reader quickly to a small set of references. Whenever the reader finds more than ten articles indexed under a given primary term, we must provide him further means of refining his search. It should also be remembered that the *PSI* was expressly designed to augment the *Citation Index, to foster information recovery for a partially remembered title* when a key word is known but not a citation.

In a similar fashion, we have established that the occurrence of a given reference citation 15 or more times in a given year clearly identifies a *putative* primordial term which should be characterized in natural-language terms for our *Dictionary of Primordial Citations*. We must realize that this is a constantly changing task. The Banting and Best paper on pancreatic extract mentioned earlier would be sought under the term **insulin.** The searcher wants mechanisms for quickly identifying reasonable numbers of references in a reasonable time. Dictionaries or thesauri based on these frequency analyses appear to be reasonable objectives. Of course, this can also be done with a controlled authority list like MeSH. But changes in MeSH result from analysis of indexing practices rather than analysis of the terminology occurring in the medical literature. There is no reason, however, why the two approaches cannot eventually be reconciled.

I would now like to turn from the theory of bibliographic symbols to the field of *historio-bibliography. If I may* paraphrase a great American, Dr. Martin Luther King, I have a dream. In Wellsian terms, this dream was symbolized as *World Brain* and by Vannevar Bush (1945) as *Memex*. Unlike Mr. Wells, I hope to see *my* dream become a reality while I am still among you.

In the first part of my presentation, I discussed the *primordial term as it related to* the traditional problem of subject analysis of library materials. At least one major significant by-product is attached to the use of primordial citations, which in this

respect differ from their counterpart, primordial words. Bibliographic citations, as we have seen, not only identify or symbolize subject matter, but as 'addresses', citations contain chronological information which permit one to easily arrange them. When this is done, one has a crude history of the development of a subject. This is not new. Retrospective bibliographies have been arranged in chronological order for quite some time. But now, let us see what happens when we use, not merely the citations which identify the source documents, but also the reference citations. In Fig. 4, I have drawn a circle for each citation shown in a bibliography on staining of nucleic acids, and given each one an accession number. Unlike a traditional bibliography, the set of 15 source citations is drawn in a network diagram in which the lines with arrows

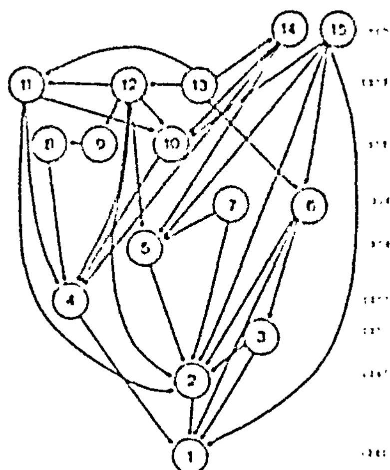


Fig. 4. Citation network of articles on nucleic acids. Citation relationships illustrated by network of 15 papers from a bibliography on nucleic acid staining.

indicate that, for example, paper 13 has cited paper 6. Anyone can create such a diagram for a simple network and I always make my students at the University of Pennsylvania do this when they compile a bibliography. When the number of source documents in the network becomes quite large, however, one can run into considerable difficulty in simply portraying this information. In a recent paper we have shown how these problems of display can be overcome (Garfield and Sher, 1967; *see also* Garfield and Malin, 1969). It is not my intention or purpose to digress to this interesting problem. The important point I wish to stress is that we have available a means for displaying citation networks without human intervention.

What is the significance of all this for the medical historian and bibliographer? It means that, in the near future, the compilation of bibliographies will be inseparable from writing the history of that field. A scholar will be able to sit before his computer console and he will specify some starting point — a person, a word, a citation, a place. Given a particular word or document, he will then ask the computer to display a list of pertinent papers. Then the computer will draw or display for him a historical road map which will show him not merely the list of papers and books, but also a graphical approximation or detailed history of that subject. In an earlier paper (Garfield *et al.*, 1964), we simulated this process by reconstructing the recent history of the genetic code by a process of citation analysis. At that time we traced the history up to the time of Nirenberg's now classical paper.

It is difficult to comprehend how hard it is to display such information until one tries to draw the *complete* diagram of any given field. But again, frequency analysis simplifies the problem; with certain exceptions we can eliminate anything from the overall network which does not satisfy a given critical threshold of citation linkage, and place it *temporarily* in a computer storage area. When we wish to examine the particular period in history more closely, we can do so by zooming in, and then, as historians, try to understand what significance, if any, some of the many uncited papers may have. We know, in fact, that probably 10% or more of the literature is never cited again once it is published – possibly a measure of the redundancy necessary to insure that any average paper does, in fact, get into the general stream of things (Price, 1965).

The recent history of DNA was reconstructed by vastly more simple procedures than that which we employed to do the early history of the genetic code The basic assumption was simple: given a list of the recent papers on the topic, about 30 or 40 published in 1967 and cited in a single review or found in a straightforward literature search, the bibliographies of all the 1967 papers were examined and a master list compiled. Since several hundred papers were cited, all were eliminated which were cited only once. By a process of iteration, the next group of cited references to be eliminated were those cited only twice, etc. Eventually, this led to the list of papers shown in Fig. 5, each of which was cited five or more times. Subsequently, the list of papers was checked in the 1967 *Science Citation Index* and we attained a further verification of the significance of each paper by ascertaining that they are also highly cited in general. It is significant that for a fast-moving, active field like molecular biology, one must repeat this type of procedure for each preceding year if one wishes to completely fill in the eventful years from 1961 to 1967, during which time we have come from the breaking of the genetic code all the way to *in vitro* synthesis of life in the recent work of Kornberg *et al.* (refer to Appendix B for citation data to Fig. 5).

Of further significance is that *many* of these papers (indicated by black circles in Fig. 5) appear on our list of most heavily cited papers in the literature. Since that list is confined to the 1% per year which are cited 15 or more times per year, one would expect that a lower rate, about 5 cites per year as it turns out, would be sufficient for a specialized field. Thus, to write the entire history of science and medicine as distinct from merely writing the history of DNA or any other specific topic, one's interest would center on events of broader impact and scope.

By way of reiteration, I wish to mention that this history of DNA was written by my assistant, Marie V. V. Williams, under my instructions, even though neither of us knows anything about genetics. I do not think any geneticist would seriously challenge the diagram in Fig. 5, and it, therefore, becomes a perfectly valid teaching aid to the student and a great time saver for the historian.

Let me spell out the implications of these examples — if they are not self-evident from my discussion — for your future dealings with the reader who is faced with a common problem: given a bibliography of 100 papers on any selected field — and today that is commonplace — how can one select the key group of papers to read *first?* One must make choices since he cannot possibly read everything. Here you have seen how, starting with several hundred references, we have identified a dozen

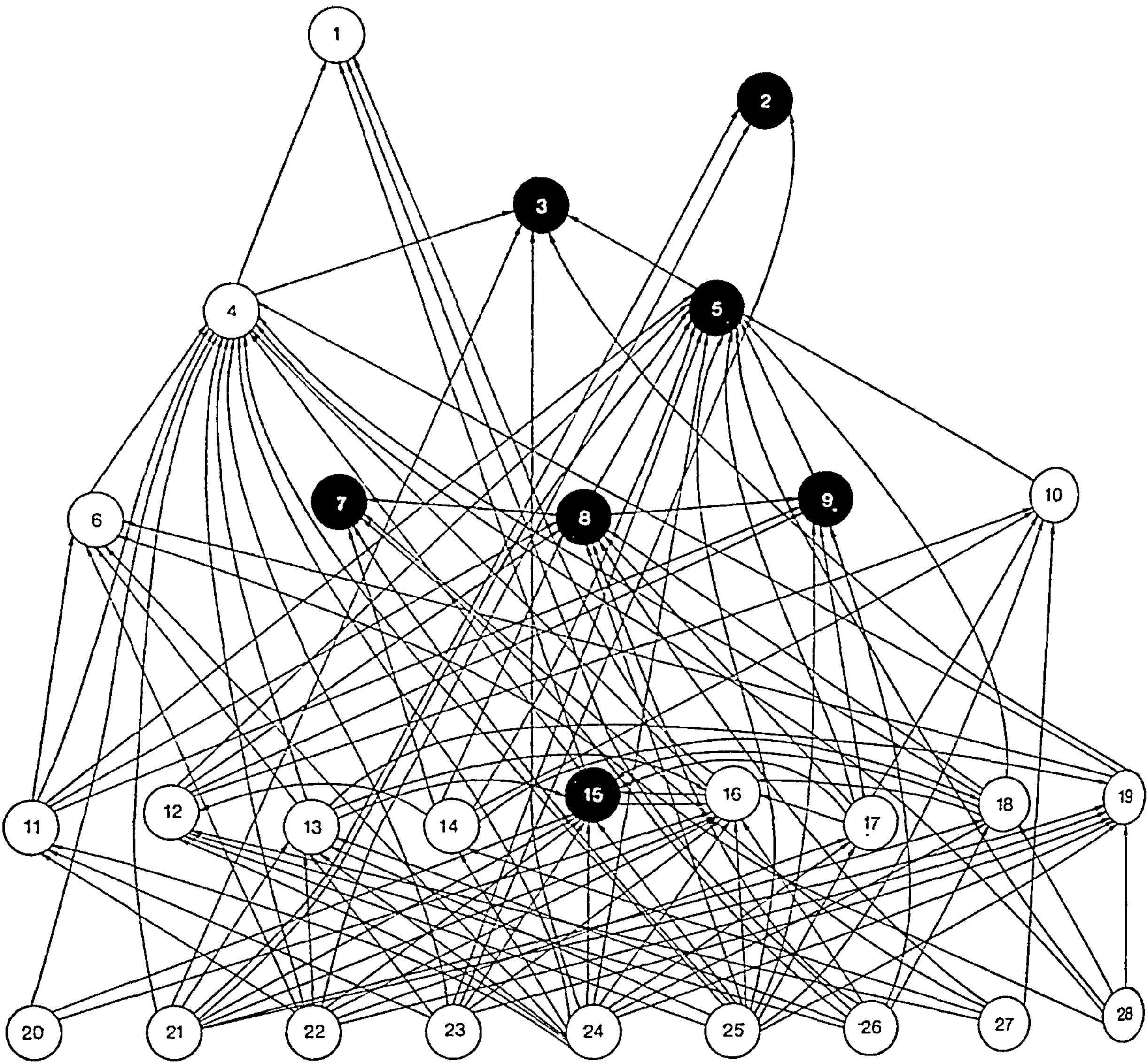


Fig. 5. Citation network of DNA articles based on review of 1967 literature by A. Sadgopal in *Advances* in *Genetics* (Academic Press, New York, 1968, v. 14, p. 325-404). Legend (refer to Appendix B): 1, Sheehan 1958; 2, Bray 1960; 3, Nirenberg 1961; 4, Marcker 1964; 5, Nirenberg 1964; 6, Marcker 1965; 7, Brenner 1965; 8, Khorana 1965; 9, Nirenberg 1965; 10, Khorana 1965; 11, Marcker 1966; 12, Khorana 1966; 13, Marcker 1966; 14, Khorana 1966; 15, Adams 1966; 16, Webster 1966; 17, Nirenberg 1966; 18, Ochoa 1966; 19, Nakamoto 1966; 20, Berberich 1967; 21, Lucas-Leonard 1967; 22, Caskey 1967; 23, Ochoa 1967; 24, Khorana 1967; 25, Nirenberg 1967; 26, Ochoa 1967; 27, Khorana 1967; 28, Ochoa 1967.

RANK	AUTHOR	TOTAL TIMES CITED	RANK	AUTHOR	TOTAL TIMES CITED
1	LOWRY OH	2921	26	ELIEL EL	721
2	CHANCE B	1374	27	STREITWIESER A	717
3	LANDAU LD	1174	28	MULLIKEN RS	712
4	BROWN HC	1150	29	JACOB F	711
5	PAULING L	1063	30	BORN M	710
6	GELLMANN M	942	31	BRACHET J	706
7	COTTON FA	940	32	WINSTEIN S	702
8	POPLE JA	933	33	ALBERT A	687
9	BELLAMY LJ	908	34	LUFT JH	674
10	SNEDECOR GW	904	35	DEDUVE C	673
11	BOYER PD	883	36	VONEULER US	668
12	BAKER BR	876	37	FIESER LF	666
13	KOLTHOFF IM	853	38	HUISGEN R	661
14	HERZBERG G	842	39	NOVIKOFF AB	655
15	FISCHER F	826	40	GOODWIN TW	643
16	SEITZ F	822	41	BARTON DHR	632
17	DJERASSI C	801	42	FISHER RA	631
18	BERGMEYER HU	754	43	BATES DR	627
19	WEBER G	750	44	FLORY PJ	628
20	REYNOLDS ES	748	45	STAHL E	626
21	MOTT NF	741	46	DEWAR MJS	619
22	ECCLES JC	737	47	GILMAN H	618
23	FEIGL F	729	48	FOLCH J	618
24	FREUD S	727	49	DISCHE Z	614
25	PEARSE AGE	726	50	GLICK D	609

Fig. 6. Fifty most cited authors for 1967, ranked according to total times cited.

papers which represent the core of this field, and the 'field' can, of course, be individually tailored to the reader's needs. If you have done the recent history of DNA for one student, it can be used by another; but if faculty members or researchers have chosen less known topics, one must be equally prepared to solve their selective reading problems as well.

Finally, let me briefly turn from the topic of historio-bibliography to that of sociology. At the recent AAAS meeting I presented a paper, 'Can Nobel Prize winners be predicted?' (Garfield and Malin, 1968). The title was somewhat facetious, but actually a more correct title would be 'Can the Nobel Prize winners be forecasted?'. 'To predict' is a very strong term, one expected from the followers of Nostradamus. 'To forecast' is a probabilistic term: a meteorologist forecasts the weather by stating certain probabilities; he cannot predict the weather with absolute certainty.

In the same way, it is not possible to predict using the *SCI*; it is possible, however, to say that from the list of men shown in Fig. 6, one can forecast with high probability that several will receive the Nobel Prize. This is no small achievement when one considers that the approach is based on a purely objective method which does not require a personality appraisal or a reading of the works by these men.

The ultimate decisions will, of course, be made by their peers in the Swedish Academy, etc., but there can be little doubt, as was stated by Newell (1962), that citation indexes will be used increasingly as a means of evaluating scientific merit. This was originally proposed by Golay (1953) and recently expressed by Cranberg (1969) in *Physics Today*. This will, of course, require more meticulous attention to bibliographic practices to insure fair treatment for all, but within the bounds of acceptable error, the evidence is very clear that the *SCI* has become a major sociometric tool. The recent work of the Coles (1968) and others is merely a harbinger of future developments.

I have tried to show the inseparable relationship that exists between the conceptual problems of bibliographic control, subject analysis, symbol theory, and the history and sociology of medicine. It has been an ambitious undertaking. Undoubted-

ly, I have only scratched the surface and I leave it to others with less pragmat concerns than publishing a work of the size and scope of the *SCI*. Let the scholars li Professors Merton and Price do their job. We have certainly given them all t ammunition they need.

In closing, let me relate that we now plan to complete the data base that will needed to fully arm the historian who wishes to deal with the history of the deca 1961-1970. As soon as practical, we will fill in the *SCI* for the missing years of 1962 a 1963, and at the same time use the ten-year data base to create discipline-orient indexes which will include chemistry and physics as well as the social sciences a education. By the time this enormous data base is completed, we expect that o computer hardware and software will be caught up and the dream I have sketch here will be realized at least insofar as we presently conceive of it.

appendix A

Titles of fifty most cited articles for 1967 ranked according to total number of tim cited (refer to Fig. 1).

rank

1. LOWRY, O. H., ROSEBROUGH, N. J., FARR, A. L. and RANDALL, R. J., Protein measureme with the folin phenol reagent.
2. REYNOLDS, E. S., The use of lead citrate at high pH as an electron-opaque stain in electr microscopy.
3. LUFT, J. H., Improvements in epoxy resin embedding methods.
4. FISKE, C. H. and SUBBAROW, Y., The colorimetric determination of phosphrous.
5. FOLCH, J., LEES, M. and SLOANE STANLEY, G. H., A simple method for the isolation a purification of total lipides from animal tissues.
6. BRAY, G. A., A simple efficient liquid scintillator for counting aqueous solutions in a liqu scintillation counter.
7. SABATINI, D. D., BENSCH, K. and BARRNETT, R. J., Cytochemistry and electron microscop the preservation of cellular ultrastructure and enzymatic activity by aldehyde fixation.
8. SPACKMAN, D. H., STEIN, W. H. and MOORE, S., Automatic recording apparatus for use in t chromatography of amino acids.
9. GORNALL, A. G., BARDAWILL, C. J. and DAVID, M. M., Determination of serum proteins means of the biuret reaction.
10. LINEWEAVER, H. and BURK, D., The determination of enzyme dissociation constants.
11. BURTON, K., A study of the conditions and mechanism of the diphenylamine reaction for t colorimetric estimation of deoxyribonucleic acid.
12. DUNCAN, D. B., Multiple range and multiple F tests.
13. SCHEIDEGGER, J. J., A micro-method for immuno-electrophoresis. (In French).
14. DOLE, V. P., A relation between non-esterified fatty acids in plasma and the metabolism glucose.
15. DAVIS, B. J., Disc electrophoresis. II. Method and application to human serum proteins.
16. NELSON, N., A photometric adaption of the Somogyi method for the determination of glucose
17. REED, L. J. and MUENCH, H., A simple method of estimating fifty per cent endpoints.
18. MOORHEAD, P. S., NOWELL, P. C., MELLMAN, W. J., BATTIPS, D. D. and HUNGERFORD, D. A. Chromosome preparations of leukocytes cultured from human peripheral blood.
19. MARMUR, J., A procedure for the isolation of deoxyribonucleic acid from micro-organisms.
20. JACOB, F. and MONOD, J., Genetic regulatory mechanisms in the synthesis of proteins.
21. WATSON, M. L., Staining of tissue sections for electron microscopy with heavy metals.
22. PALADE, G. E., A study of fixation for electron microscopy.
23. KARNOVSKY, M. J., Simple methods for staining with lead at high pH in electron microscopy.

24. MARTIN, R. G. and AMES, B. N., A method for determining the sedimentation behavior of enzymes: application to protein mixtures.
25. SMITHIES, O., Zone electrophoresis in starch gels: group variations in the serum proteins of normal human adults.
26. BARTLETT, G. R., Phosphorus assay in column chromatography.
27. BARKER, S. B. and SUMMERSON, W. H., The colorimetric determination of lactic acid in biological material.
28. EAGLE, H., Amino acid metabolism in mammalian cell cultures.
29. ROSENFELD, A. H., BARBARO-GALTIERI, A., PODOLSKY, W. J., PRICE, L. R., SODING, P., WOHL, C. G., ROOS, M. and WILLIS, W. J., Data on particles and resonant states.
30. GELL-MANN, M., Symmetries of baryons and mesons.
31. TREVELYAN, W. E., PROCTER, D. P. and HARRISON, J. S., Detection of sugars on paper chromatograms.
32. WARREN, L., The thiobarbituric acid assay of sialic acids
33. ANDREWS, P., Estimation of the molecular weights of protein in Sephadex gel-filtration.
34. MONOD, J., WYMAN, J. and CHANGEUX, J. P., On the nature of allosteric transitions: a plausible model.
35. SCHMIDT, G. and THANNHAUSER, S. J., A method for the determination of desoxyribonucleic acid, ribonucleic acid, and phosphoproteins in animal tissues.
36. BARDEEN, J., COOPER, L. N. and SCHRIEFFER, J. R., Theory of superconductivity.
37. DEDUVE, C., PRESSMAN, B. C., GIANETTO, R., WATTIAUX, R. and APPELMANS, F., Tissue fractionation studies. 6. Intracellular distribution patterns of enzymes in rat-liver tissue.
38. KARPLUS, M., Contact electron-spin coupling of nuclear magnetic movements.
39. AHLQUIST, R. P., A study of the adrenotropic receptors.
40. DUBOIS, M., GILLES, K. A., HAMILTON, J. K., REBERS, P. A. and SMITH, F., Colorimetric method for determination of sugars and related substances.
41. ELLMAN, G. L., Tissue sulfhydryl groups.
42. WARBURG, O. and CHRISTIAN, W., Isolation and crystallization of the fermentation ferment enolase. (In German).
43. GELL-MANN, M., The symmetry group of vector and axial vector currents.
44. MANDELL, J. D. and HERSHEY, A. D., A fractionating column for analysis of nucleic acids.
45. DOLE, V. P. and MEINERTZ, H., Microdetermination of long-chain fatty acids in plasma and tissues.
46. LITCHFIELD JR., J. T. and WILCOXON, F., A simplified method of evaluating dose-effect experiments.
47. MILLONIG, G., Advantages of a phosphate buffer for OsO_4 solutions in fixation.
48. FRIEDEMANN, T. E. and HAUGEN, G. E., Pyruvic acid. II. The determination of keto acids in blood and urine.
49. MOORE, S. and STEIN, W. H., A modified ninhydrin reagent for the photometric determination of amino acids and related compounds.
50. JAFFE, H. H., A reexamination of the Hammett equation.

appendix B

Citations to network of DNA articles based on review of 1967 literature by A. Sadgopal in *Advances in Genetics* (Academic Press, New York, 1968, v. 14, p. 325-404) (refer to Fig. 5).

node

1. SHEEHAN, J. C. and YANG, D. M. (1958), The use of N-formylamino acids in peptide synthesis. J. Amer. Chem. Soc., 80, 1154
2. BR
3. NIRENBERG, M. and MATTHAEI, J. H. (1961), The dependence of cell-free pro

E. coli upon naturally occurring or synthetic polyribonucleotides. *Proc. nat. Acad. Sci. (Wash.)*, 47, 1588.
4. MARCKER, K. A. and SANGER, F. (1964), N-formylmethionyl-sRNA. *J. molec. Biol.*, 8, 835.
5. NIRENBERG, M. and LEDER, P. (1964), RNA codewords and protein synthesis-effect of trinucleotides upon binding of sRNA to ribosomes. *Science*, 145, 1399.
6. MARCKER, K. (1965), Formation of N-formyl-methionyl-sRNA. *J. molec. Biol.*, 14, 63.
7. BRENNER, S., STRETTON, A. O. W. and KAPLAN, S. (1965), Genetic code — nonsense triplets for chain termination and their suppression. *Nature*, 206, 994.
8. SÖLL, D., OHTSUKA, E., JONES, D. S., LOHRMANN, R., HAYATSU, H., NISHIMURA, S. and KHORANA, H. G. (1965), Studies on polynucleotides. 49. Stimulation of binding of aminoacyl-SRNAS to ribosomes by ribotrinucleotides and a survey of codon assignments for 20 amino acids. *Proc. nat. Acad. Sci. (Wash.)*, 54, 1378.
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10. NISHIMURA, S., JONES, D. S., OHTSUKA, E., HAYATSU, H., JACOB, T. M. and KHORANA, H. G. (1965), Studies on polynucleotides. 47. *In vitro* synthesis of homopeptides as directed by a ribopolynucleotide containing a repeating trinucleotide sequence — new codon sequences of lysine glutamic acid and arginine. *J. molec. Biol.*, 13, 283.
11. BRETSCHER, M. S. and MARCKER, K. A. (1966), Polypetidyl-s-ribonucleic acid and amino-acyl-s-ribonucleic acid binding sites on ribosomes. *Nature*, 211, 380.
12. JONES, D. S., NISHIMURA, S. and KHORANA, H. G. (1966), Studies on polynucleotides. 56. Further syntheses in vitro of copolypeptides containing 2 amino acids in alternating sequence dependent upon DNA-like polymers containing 2 nucleotides in alternating sequence. *J. molec. Biol.*, 16, 454.
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14. MORGAN, A. R., WELLS, R. D. and KHORANA, H. G. (1966), Studies on polynucleotides. 59. Further codon assignments from amino acid incorporations directed by ribopolynucleotides containing repeating trinucleotide sequences. *Proc. nat. Acad. Sci. (Wash.)*, 56, 1899.
15. ADAMS, J. M. and CAPECCHI, M. R. (1966), N-formylmethionyl-sRNA as initiator of protein synthesis. *Proc. nat. Acad. Sci. (Wash.)*, 55, 147.
16. WEBSTER, R. E., ENGELHARDT, D. L. and ZINDER, N. (1966), In vitro protein synthesis — chain initiation. *Proc. nat. Acad. Sci. (Wash.)*, 55, 155.
17. KELLOGG, D. A., DOCTOR, B. P., LOEBEL, J. E. and NIRENBERG, M. (1966), RNA codons and protein synthesis. 9. Synonym codon recognition by multiple species of valine-, alanine-, and methionine-sRNA. *Proc. nat. Acad. Sci. (Wash.)*, 55, 912.
18. STANLEY, W. M., SALAS, M., WAHBA, A. J. and OCHOA, S. (1966), Translation of genetic message — factors in initiation of protein synthesis. *Proc. nat. Acad. Sci. (Wash.)*, 56, 290.
19. NAKAMOTO, T. and KOLAKOFSKY, D. (1966), A possible mechanism for initiation of protein synthesis. *Proc. nat. Acad. Sci. (Wash.)*, 55, 606.
20. BERBERICH, M. A., KOVACH, J. S. and GOLDBERGER, R. F. (1967), Chain initiation in a polycistronic message — sequential versus simultaneous derepression of enzymes for histidine biosynthesis in Salmonella typhimurium. *Proc. nat. Acad. Sci. (Wash.)*, 57, 1857.
21. LUCAS-LENARD, J. and LIPMANN, F. (1967), Initiation of polyphenylalanine synthesis by N-acetylphenylalanyl/sRNA. *Proc. nat. Acad. Sci. (Wash.)*, 57, 1050.
22. CASKEY, C. T., REDFIELD, B. and WEISSBACH, H. (1967), Formylation of guinea pig liver methionyl-sRNA. *Arch. Biochem.*, 120, 119.
23. SALAS, M., HILLE, M. B., LAST, J. A., WAHBA, A. J. and OCHOA, S. (1967), Translation of genetic message. 2. Effect of initiation factors on binding of formyl-methionyl-tRNA to ribosomes. *Proc. nat. Acad. Sci. (Wash.)*, 57, 387.
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25. MARSHALL, R. E., CASKEY, C. T. and NIRENBERG, M. (1967), Fine structure of RNA code-words recognized by bacterial amphibian and mammalian transfer RNA. *Science*, 155, 820.
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on national medical bibliographies

H. Friis

In this contribution the problems concerning national medical bibliographies will be discussed, based on a survey of the Danish medical bibliography: *Index Medicus Danicus*. I hope that the exposition of this concrete example will give rise to a discussion of the general principles.

history

From old times the large scientific libraries have felt it their duty to disseminate knowledge of the literature of their own country through participation in the publication of national bibliographies. With the growth of the number of scientific publications it was logical to divide up these bibliographies according to subject fields. The University Library, founded in 1482 and Denmark's oldest library, since 1913 has been responsible for the running publication of the *Index Medicus Danicus*. Naturally, much of medical interest is also included in other lists, but this will not be further discussed here. If a collected survey of Danish medical literature production is wanted, then the *Index* must be consulted.

bibliotheca medica danica

The literature to 1913 is covered by *Bibliotheca Medica Danica*, which was prepared by O.C.S. Preisler (born 1879, *cand. med.* 1905, died 1920). He was a general practitioner with a private practice in Lyngby near Copenhagen, and he undertook the preparation of *Bibliotheca Medica Danica* as a hobby. Unfortunately, no money was available for the printing of this work, so only four typewritten copies are in existence today. Later on, the material was made available on microfilm. Preisler aspired to register all Danish medical books and journal articles from the oldest times to 1913. He relied, of course, on older bibliographies, but it was still an enormous task to collect all the material. Naturally, some works escaped his notice; even today a few works are discovered that Preisler missed. These items are registered on cards held by the University Library. The compilation itself is arranged in systematic groups in six volumes which have a final register volume with alphabetic author and subject indexes.

index medicus danicus 1913-1927

On establishing the *Index Medicus Danicus* in 1913, the University Library took over the responsibility of publishing Denmark's medical bibliography. This *Index* consists of typewritten cards and, in its original form, only exists in two copies. It has been recently made available in xerographic book form. Later additions are still filed in the card index. This is arranged according to the dictionary principle, with author cards and subject cards interfiled.

index medicus danicus 1928-1947

Interest in running information about Danish medical literature increased, however, so from 1928 printed cards were produced, making possible much larger issues of cards. It was possible to subscribe to the cards, which were distributed at regular intervals to hospitals and other medical institutions as well as to specialists who could subscribe to the material that was relevant to their subject fields. This part of the *Index Medicus Danicus* is therefore still in existence not only at scientific libraries, but also at many of the larger hospitals in Denmark. Therefore, it has not been made available in book form. The arrangement of the cards is chiefly as described for the earlier period. The bibliography is annotated, and the notes are so comprehensive that they may be called 'mini-abstracts'.

index medicus danicus 1948-1949

In 1950 it was decided to publish the *Index* in periodical form, as it was proving too difficult for many subscribers to keep the large numbers of cards in order. At this time, due to various reasons, the *Index* was two years behind with the production of the printed cards. The material for the years 1948 and 1949 was later published in book form (format 8°); the Danish notes are, however, slightly shorter than in the earlier material. Entries are arranged alphabetically by author, or by title for anonymous works. In addition, the book is provided with a subject index.

index medicus danicus 1950-1953

Simultaneous with the decision to publish the *Index* in periodical form, it was decided that it should be produced in English in the future so as to attract a larger circle of users. For the first four years it was published as a quarterly (format 8°); eight issues made up one volume, to which was added a cumulated author and subject index in separate alphabetic lists.

index medicus danicus 1954-

From 1954, collaboration was initiated between the University Library (now its 2. Department, established in 1938) and the Danish Medical Association. It was decided that the *Index* should in future appear as a special bibliographic supplement to the *Danish Medical Bulletin* which is published for the Medical Faculties of the Universities of Copenhagen and Aarhus and the National Health Service of Denmark. This periodical is again a supplement to *Ugeskrift for Læger* (Weekly Journal for Physicians).

This agreement meant that the *Index* was given a much larger circulation than before, as the same number of copies was issued as for the *Danish Medical Bulletin* (13,000 at present). At the same time, the financial situation of the *Index* was ensured, as the University Library 2. Department now chiefly covers the expenses in connection with salaries, while paper, printing, and distribution costs are on the whole covered by the Danish Medical Association. A further result of the agreement was that the *Index* had to change format to suit that of *Ugeskrift for Læger* (4°).

At the same time, the number of issues was reduced to one every six months. In addition, a preliminary index issue is published every year, and is cumulated every

fourth year, so that there are still eight issues and an index issue in each volume. The material in the semi-annual issues is divided up into 35 systematic groups which correspond to the systematic divisions of the medical stock catalogues of the University Library 2. Department. Each book or article is given a main entry in one and only one of these groups, but in addition it is possible to use an unlimited number of short cross-references in other groups. In practice, however, it is extremely rare that more than four secondary entries are needed per main entry, and the average is about one. These secondary entries are collected at the beginning of each of the 35 groups They have the following form: **Cancer of the pancreas** 116:6, showing that a paper on this subject, but not necessarily under this title, has been given a primary entry under no. 6 of group 16 in issue 1. After this follow the main entries of each group These are arranged alphabetically according to author; anonymous works such as conference proceedings, laws, reports, etc., are placed first. References to earlier volumes of the *Index* have the following form: 3:708:4, indicating no. 4 of group 8 in issue 7 of volume 3. The names of periodicals are abbreviated as far as possible according to the listing of *World Medical Periodicals* issued by the World Medical Association.

present problems

Index Medicus Danicus still aims to register the total Danish production of medical literature, plus the few works written by foreign authors on Danish medical matters as well as Danish translations of foreign medical works. However, the articles must be original contributions; reports on the work of others, book reviews, etc., are not registered. There are certain problems connected with the publishing of the *Index.*

increase in volume of work and scattering of items for registration

In Denmark, as in other countries, there has been a literature explosion; in part the number of items to be registered has increased, and in part the items to be registered are scattered throughout an increasing number of journals, congress reports, etc. This means that the task of registration has not only increased proportionally with the number of literature items, but has increased still further since the work of tracing the items has become even more difficult.

Some figures can perhaps best illustrate this point. Even though an increasing amount of material has been transferred to the unprinted *Index Medicus Danicus* (to be discussed later), the number of items in the printed *Index* has still increased. In 1950 there were 900 main entries, but in 1967 these had swollen to 2,250. This gives a doubling time of about 12 years. At the same time, the number of cross-references has increased, not only in step with the increase of main entries, but still further as they are now more liberally used than previously. The application of subject headings has also become more liberal; there are now almost three subject entries per article. At present the annual production of cards from the Publication Department is about 2,500 white main cards (many of these have been altered and combined with others to effect the 2,250 main entries mentioned above), approximately 2,500 blue reference cards, about 1,000 yellow cards for the unprinted *Index Medicus Danicus,* n

4,000 author cards, and about 6,000 subject index cards — giving a total of about 16,000 cards a year.

It is more difficult to obtain a numerical impression of the scattering of items for registration, but it may be mentioned that in a one-year period from 1967 to 1968 there were Danish contributions registered in 91 periodicals in which no earlier contributions had been noted. This means that tracking down is becoming more and more problematic. The 200 most important periodicals are received by the Publication and Documentation Department for inspection, and in the Periodicals Department a further 550 periodicals are scanned, but this scanning has to take place very swiftly and not all the Danish contributions can be located here. If everything is to be located it would be necessary to inspect all the 7,000 medical periodicals issued at present. To track down any article that may have escaped notice, the literature reference lists of Danish articles are now checked through when the articles are registered. Finally, Danish doctors are requested to send reprints of their articles to the University Library 2. Department, especially if these articles appear in irregular, less well-known periodicals.

strained economy

A further problem has been the financial situation of the *Index Medicus Danicus*. To keep the production price of the *Index* as low as possible, it was decided to eliminate popular articles and books; but it is, of course, difficult to determine the boundary between the semi-popular and the scientifically valuable works. To ensure sufficient coverage it was decided to register semi-popular articles, for example, articles by doctors in the popular periodical *Helse*, in the so-called 'unprinted' *Index Medicus Danicus*, which is a card index that exists in a single copy at the University Library 2. Department. Here are now included the contributions of Danish doctors to various professional society meetings, travel reports, etc. As this unprinted *Index* is arranged alphabetically according to author, it is of limited value. The amount of material contained in the unprinted *Index* is about 1/5 of that in the printed *Index*.

Another way of keeping down the production price has been to abbreviate the annotations even further. Today, most notes are merely a translation of the title into English, if the article is not already in English.

The annual expenses for the production of *Index Medicus Danicus* are approximately $10,000, which, with a circulation of 13,000 copies, gives a price of 25 cents per copy — a price which must be said to be very low.

lack of staff

However, the greatest problem has been the lack of staff. The number of staff in the Department has remained unchanged throughout the years. There is one physician who spends three-quarters of his time on the production of *Index Medicus Danicus*, one half-time secretary, and two free-lance proof-readers. With the great increase in work indicated above, the situation has become increasingly strained. When there is sickness or other absence among the staff, work has to be carried out by emergency substitutes, and delays are unavoidable. The latest major contribution to delay occurred a couple of years ago when the post of editor remained vacant for nearly a

year because of a salary dispute. At present, therefore, the *Index* is nearly two years behind schedule, which is most unfortunate, since the value of any *Index* is reduced the more it lags behind the publication date of the literature registered. In future it is therefore necessary to ensure that the production of an index of this nature is not utterly dependent on one person, and that there are suitable understudies who can take over when needed.

technical problems

Finally, there are the more technical problems, which are probably relatively specific to *Index Medicus Danicus*, and are thus hardly of any general interest; therefore, only the question of terminology will be mentioned. This problem has been dealt with at numerous international meetings, in particular within the individual fields of medicine, but general medical terminology has also been the object of lively discussion. No final solution to the problem has been reached. I have therefore chosen to make the subject headings conform as much as practically possible to those used in *Index Medicus*. However, there are numerous subject headings used that are not to be found in the rather sparse vocabulary of Medical Subject Headings (MeSH). But, at any rate, it must be an advantage for users that the terminology conforms closely to that of an already extant, generally known and used system. Also, with regard to the future, this point is of importance, as will be mentioned in the following.

the future

In view of all these problems it may be doubtful whether there is any future for national medical bibliographies. With the wide distribution of such works as *Index Medicus* and *Excerpta Medica*, the interest in national medical bibliographies has waned.

In Denmark, the Danish Medical Association has had an interest in the publication of a collected survey of the medical literature production in this country. Furthermore, one of the tasks of the newly appointed state Medical Research Council is to provide a survey of all medical research in Denmark. Thus, there will certainly also be interest on their part in a continued *Index Medicus Danicus* in some form or other. It must not be forgotten that only about half the material contained in the *Index*, and almost none of the material in the unprinted *Index*, is to be found in the American *Index Medicus*. And even the material that can be found in the American *Index* does not always immediately appear as Danish; furthermore, this material is scattered and therefore difficult to locate. Finally, the publication is of obvious interest to libraries and their medical clientele. Therefore, temporary and more permanent difficulties must not be allowed to be decisive for the continuance of the national medical bibliography. One must try to find solutions to the problems.

We have started preliminary discussions with the publisher of *Dania Polyglotta*, as this publication overlaps to a certain extent with the *Index Medicus Danicus*. Such a duplication of efforts is neither rational nor economic, so on this point some rationalization could certainly be achieved.

The unprinted *Index Medicus Danicus* is, as mentioned, of rather limited value; therefore, I feel that it would be logical to register some of this material in *Dansk Tidsskrift Index* (Danish Periodical Index), especially the popular items which are of particular interest to users of public libraries, and there is already a certain duplication of registration taking place in this field. One could certainly cease to register part of the remaining material in the future. These measures would save some of the time spent in copying, but they would not save the medical editor of the *Index* much time.

These elements would naturally be included in a collective national plan for bibliographic control; such a plan would naturally be treated in the State Council for Scientific and Technical Information and Documentation which is at present being established in Denmark.

Also, on an international level, there are possibilities for co-operation and rationalization. The recently appointed Nordic Publications Board for Medicine will, among other tasks, work on the provision of good abstracts in English for all valuable Nordic medical articles. If this can be effected, it will ease the task of indexing for *Index Medicus Danicus.*

The development concerning MEDLARS seems to entail that each country must undertake to index its own medical literature for *Index Medicus.* This will also be the responsibility of the Publication and Documentation Department of the University Library 2. Department, and will naturally provide the opportunity for a rational co-ordination with registration for *Index Medicus Danicus.* The discussions with the National Library of Medicine about providing all articles included in the MEDLARS project with a code denoting the country of origin of the article will hopefully lead to a positive result. It would then be a simple matter to copy all the Danish material here. Then it could be envisaged that *Index Medicus Danicus* be limited to comprise only material not included in *Index Medicus.* As *Index Medicus Danicus* would thereafter be predominantly of local Danish interest, it would then be natural to omit the English notes. Automatic data processing of this part of the material is not within immediate reach.

In conclusion, it can be said that the difficulties described do not warrant the cessation of the publication of *Index Medicus Danicus,* since it will certainly be possible to reduce some of these problems through rationalization in the near future. Therefore, I believe that the national medical bibliography, in some form or other, does have a future.

medical bibliography in africa

S.M. Hébert

To medical librarians it is superfluous to stress the importance of a true understanding of epidemiology and aetiology in the fight against the diseases which afflict mankind. The continent of Africa, because of the wide range of contrast which is found amongst its inhabitants — racial, religious, economic, and cultural — provides an ideal field in which to carry out research on disease, particularly on the subject of geographical pathology in relation to disease. Medical librarians can assist in this work by compiling bibliographies on specific diseases in Africa.

The compilation of such bibliographies presents difficulties. Some indication of the size of Africa compared to other countries is given in the map of Africa (Fig. 2), into which the whole of the U.S A., China, and India fit with room to spare (Daubenton, 1954). In the whole of Africa there are only 25 medical schools; there are also approximately 32 institutes for medical research, all of which have libraries of varying size. This is an incredibly small number in comparison with, say, the U.S A. where there are 86 medical schools and a great number of research institutions.*

The vast distances between medical libraries and the difficulties of communication hinder the quick exchange of information and material (Fig. 1). Many of the African medical libraries are still in their infancy and are not as yet adequately stocked or staffed. Yet they could contribute very effectively towards bibliographic work if some of the problems of communications were solved. Veterinary schools and research institutes must also be included in this network.

Changing patterns in the mode of living have caused significant changes in the incidence of diseases. A bibliography on a specific disease should, therefore, include all material that can be traced from the earliest times to the present day and be kept up to date by the publication of supplements at regular intervals. It should include not only the reports of scientists *in* Africa, but also those of workers *outside* Africa who are studying aspects of these diseases in co-operation with research workers in Africa. Such bibliographies would keep workers *au fait* with the work of others, might prevent unnecessary duplication in certain fields of research, and might even forestall the awful disappointment of some eager scientist who publishes a report of 'the first case in Africa' of some rare disease, only to be confronted some time later with evidence that it was not the first case at all.

early material

The earliest references to diseases are extremely difficult to trace. Much patient delving into runs of old journals is required. These are almost invariably badly indexed or have no indexes at all. Searches through dusty files of reports of health authorities, and annual reports of various scientific and medical institutions, yield

* These figures, extracted from various directories, are as accurate as possible.

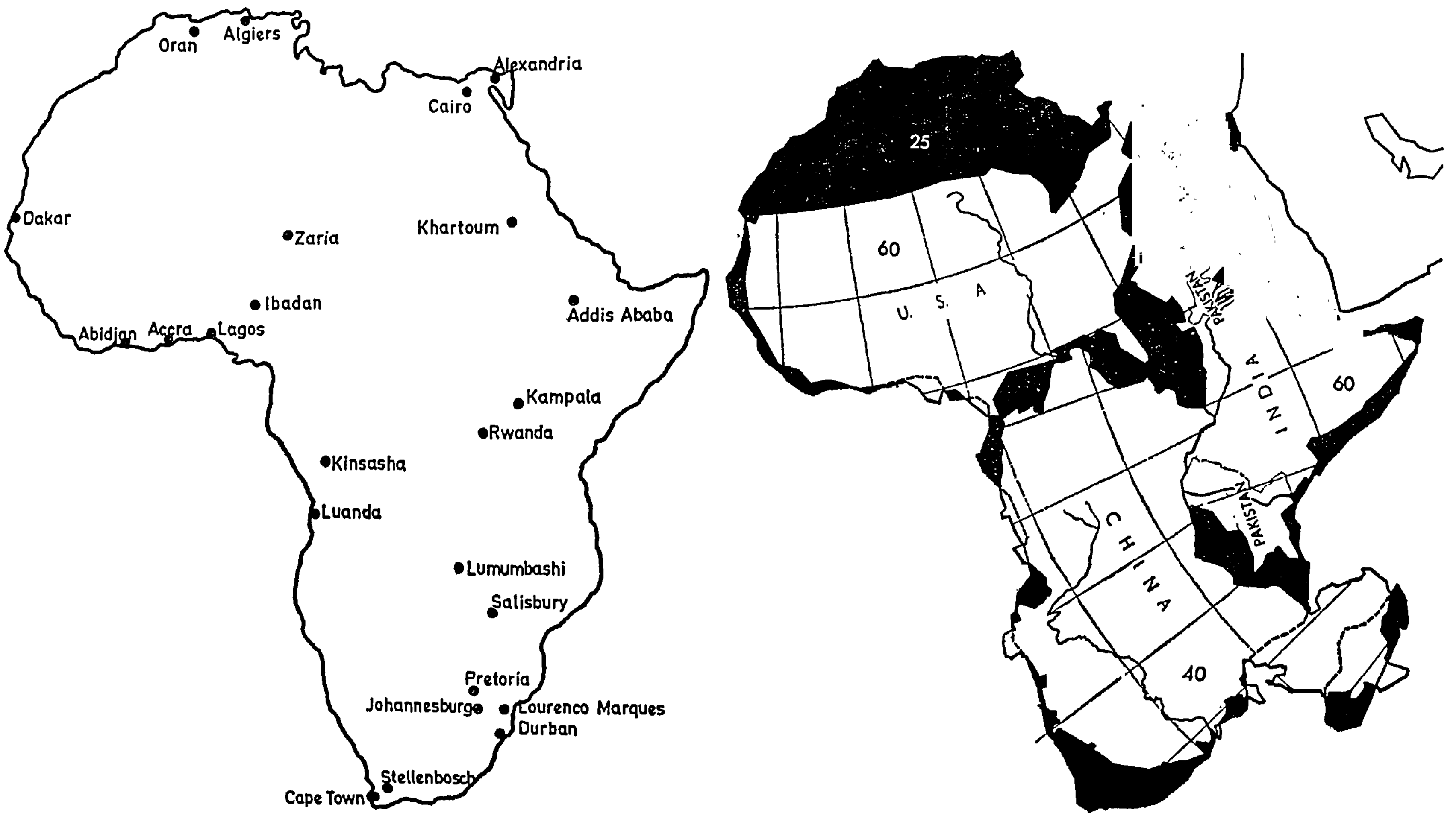


Fig. 1. Map of Africa showing the location of medical schools.
Fig. 2. Map of Africa showing the relative sizes of the U.S.A., China, and the number of medical schools in each.

promising material, but so often the references are inadequate or inaccurate and cannot be verified. (May I add that, in this changing world, human nature alone does not seem to change, and even modern references are frequently inaccurate, so let us forgive our ancestors.) Valuable information can be found in the diaries and other books of missionaries and explorers. This is a time-consuming but fascinating aspect of bibliographic work, and is of use not only to research workers but also to medical historians.

In this search for old references, it would not be fair to expect other libraries to co-operate to any large extent Few libraries, especially in developing countries, are so well staffed that they can afford the time for these searches on behalf of a bibliographer perhaps thousands of miles away. It would seem best, then, to accumulate as much material as possible and then to keep eyes and ears open for any stray references. It is amazing how things can be spotted once interest has been aroused.

recent material

Since the advent of such invaluable bibliographic aids as the *Index Catalogue of the Library of the Surgeon-General's Office*, *Index Medicus* in all its forms and titles, and the abstracting journals which it is quite unnecessary to enumerate here, the compilation of bibliographies has become relatively easier, but all the difficulties have by no means been eradicated.

Although the National Library of Medicine and the abstracting journals add every year to their lists of journals indexed, they do not and cannot scan everything that is published. Also, while the abstracting journals almost invariably name the country in which a particular work has been done, *Index Medicus* does not, and unless the word 'Africa' or the name of a country or town in Africa appear in the title, many listed references will escape the notice of the compiler. Would the NLM consider the insertion of code letters against the title listed which would indicate the country to which the article refers?

While many important articles are published in well-established journals and are therefore easily traced, just as many appear in less known, local publications. Most libraries in Africa have to operate on a strict and somewhat limited budget, and naturally will buy the internationally known journals rather than the lesser known ones. It is not always possible to obtain these local journals on an exchange basis, because of lack of suitable exchange material and for other reasons.

The compiler must then scan carefully all the journals taken currently in his library and neighbouring medical libraries, if possible. The enormous distances between medical institutions are rather hampering. Relevant articles must be noted and lists of references at the end of each article examined; thus, many a reference which had previously escaped notice will be found.

What of the articles which are never seen by the compiler, *e.g.*, articles or reports published in university magazines or students' papers which are not widely distributed, or in the humble local journals to which I have referred above? References to these articles may sometimes be found in university gazettes, or in calendars or annual reports of the institutions where the authors work, but this is not invariabl

sources themselves are not always available to the bibliographer. Theses presented a universities and books are also extremely important and must be included.

This is where organized co-operation between librarians could help compiler and ensure that subject bibliographies will be complete. Librarians always look at th journals and other literature taken by their own library and always take the 'loca rags' of their particular regions; they generally have an idea of what work thei members of staff are engaged in, or they can extract, quite painlessly, lists of publishe works by these workers. When conferences, congresses, or symposia, whether inter national or regional, are held, librarians at the centres where these take place ca readily obtain the agendas or proceedings.

Now, if it were known that the compilation of a bibliography on, *e.g.*, atheroscle rosis in Africa was undertaken by a certain institution, librarians from far afield i Africa would send lists of publications on that subject, either by members of thei staff or by medical men in their region. This could be done once or twice a year an would not involve much time or expense. It would be essential to give all details, *viz.* all authors, however many there may be, and their initials, full titles of each articl and journal or book, plus volume, inclusive pagination, and date; mention of th institutions to which the authors are attached would be helpful. The compiler woul then be able to adapt these references to suit the style in which the bibliography i compiled.

I should like to stress the importance of including even the apparently mos trifling article, by an unknown author, in an insignificant journal. Such articles ar often as necessary to make a pattern fall into place as the last bit in a jig-saw puzzl to complete a picture. Marcus Rosenblum (1967), adviser to the U.S. Public Healt Service for handling scientific information, has said that 'science is like a salmo which deposits thousands of eggs with the prospect that a mere few may live'. Th inclusion of some of the eggs otherwise doomed to oblivion may well provide fo future very tasty salmon.

Conditions are changing very rapidly in the whole of Africa, and it is now tha bibliographies on the major diseases and other aspects of medicine in Africa, such a the history of medicine in various regions and medical education, should be compiled Few medical librarians in Africa enjoy the advantages that our colleagues overseas have, such as computerized libraries, quick communications despite distances, adequat staffing and budgets. 'Do it yourself' searching is inevitable and essential. Organize co-operation would not only lighten bibliographic work, but should lead to th compilation of bibliographies which have not been attempted before.

acknowledgements

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the importance of selective bibliography to the work of medical specialists

V.M. Sosul'nikov

Considerable attention is being devoted in the Soviet Union to theoretical and practical aspects of the development of selective bibliography. During recent years, several national conferences have been held to consider how it can progress further. This interest is justified by the importance of the problems which selective bibliography aims at solving. Because of the great variety of categories of readers requiring publications of this type, it has so far proved impossible to establish common principles for the compiling of selective bibliographic aids. The greatest difficulties and doubts arise in the preparation of selective bibliography for specialists with higher qualifications in connection with their professional inquiries. In the immediate future, therefore, serious research will have to be done to study the theory and practice of preparation of bibliographies for specialists. Meanwhile, the pressure of events has made the need for selective bibliography urgent.

The rapid growth of medical literature, or the 'information explosion' as it has been called, has led to considerable difficulty not only in the notification and registration of published materials, but also in their practical use. Academician Vavilov's statement (1947) that 'Faced by mountains of libraries, modern man is in the position of a prospector who has to find a grain of gold among a mass of sand'. The great Russian clinician S. P. Botkin remarked that 'at the present time [the 1880s] so much is being written and published that it would be an impossible task to have to read everything that has been written even in one specialty. Not only that, but it would be useless, because the contents of the existing medical libraries could not be kept in any one person's head. It is essential to read selectively,' he continued, 'leaving out the less important or less valuable and concentrating on solid books and research papers, giving new facts and, most important of all, new truths' (Botkin, 1950).

Selective bibliography is recognized as an aid to choosing the most valuable and topical literature. Another reason why selective bibliography is essential is that scientific information indexes give the specialist a long list of references to the literature which he is for practical purposes unable to study. Selective bibliography enables the practitioner to study the minimum of the literature from the necessary aspect to provide a practical solution to his problem. Because of the ever-increasing interlocking of the sciences, selective bibliography on allied disciplines (chemistry, physics, mathematics) is particularly important to the medical scientist.

An important stage in the preparation of selective bibliographies is the composite planning carried out by the State Central Scientific Medical Library (SCSML), consisting of the preparation of forward plans for the five-year period and operative plans for the current year. In the period 1965-68, the SCSML and other medical libraries of the U.S.S.R. issued 60 thematic bibliographies of a selective character, covering 95 printers' sheets in all, in which about 17,000 names from the Soviet an foreign literature were listed, including 35 indexes prepared by the SCSML.

largest number of indexes were compiled for sections such as internal medicine, surgery, and paediatrics.

The principal users of selective bibliography in the field of medicine are senior students, those beginning research, practitioners, and higher-grade medical auxiliaries.

The principal types of indexes which perform a selective function are current (general), thematic and survey bibliographies, express information sheets, and guidebooks.

An example of a current bibliography is the 'Selective annotated list of new medical literature added to the SCSML shelves'. This list is issued as 3,000 duplicated copies and circulates free of charge to medical libraries and major hospitals and institutions of preventive medicine. It includes details of articles in the periodical press, textbooks, reference books, etc., published in the U.S.S.R. and elsewhere, of most interest to the practitioner. The compiler has available a subject card-index of all items published in earlier issues, and he checks the 'novelty' of the material with this card-index.

'Non-library' forms of selective bibliography, *i.e.*, information concerning the most valuable literature given on the pages of monographs and subsidiary journals, also play an important role. Most republican medical libraries regularly use local periodical publications to recommend new literature (Tadjik, Belorussian, Estonian, and other Regional Scientific Medical Libraries).

Selective indexes prepared by the SCSML and other medical libraries often contain the agendas of congresses, meetings, and conferences, matters concerned with diseases of local significance, and other items of greatest interest to practitioners and higher-grade medical auxiliaries. Assistance in compiling selective indexes is given by republican and regional libraries, and libraries of medical and research institutes.

When literature is chosen for an index of this type, consideration is paid to the novelty of the material (*i.e.*, literature published recently, containing the most new facts, is reflected), the originality of the work, and the number of copies printed (limited editions, as a rule, are not included in selective bibliographies). Some libraries have recently increasingly adopted the system of compiling selective bibliographies for narrowly specialized fields. The Ryazan Regional Medical Library, for instance, selects from its recent acquisitions the most important medical literature and issues short bibliographic lists intended for different groups of medical workers (medical administrators, specialists in various fields, etc.). Similar indexes are issued by the Georgian, Turkmenian, and other republican libraries. When preparing selective indexes, the bibliographer, who has not always received a medical education, must consult with the specialist, and in some cases the manuscript is sent to a special research institute for criticism. As a rule, the scientific editors of the index are authoritative specialists. Thematic selective indexes often include annotations. While these publications follow the same principles of selection of material and serve the same purposes, they also supply the reader with an idea of what each item listed is about. The compilers of the index on sarcoidosis (Ėrdman and Rustanovich, 1963), for instance, direct the reader's attention to the most important clinical and diagnostic aspects of the disease in connection with its great polymorphism. Considerable help is

given to the physician by indexes such as this, especially when there is no exhaustive monograph on the particular subject.

It can be concluded from the favourable criticisms received from readers and from the fact that expert recommendations can be given on new and currently important literature that publications of this type must have an important place in the system of provision of information on medical literature.

Indexes of a survey nature are very popular. Some examples are: 'The use of adrenocortical hormones in surgical practice' (Shval'b, 1967), and 'Current methods of treatment of acute thrombophlebitis and the postphlebitic syndrome' (Shval'b, 1965). The former gives details of 122 works dealing with the whole basic range of problems concerned with this subject. The bibliographic survey given in the index contains the most important information about what is contained in the source: the method of treatment, dosages, etc. Another valuable feature of this aid is that the most important material, from the point of view of the practical application of the methods described, is chosen from the large number of works published on this subject. The second index, 'Current methods of treatment of acute thrombophlebitis and the postphlebitic syndrome', is similar in its content. The compiler concentrates on informing the reader about the best works of reference containing the latest results of treatment of these diseases by anticoagulants, fibrinolytic agents, and surgical methods.

Publications such as 'Advances in medicine and medical techniques' are of great importance. Material given in the digest of 'Express information' enables research workers and practitioners to make use of discoveries without the need for consulting the original sources. The principle of selection of material for 'Advances in medical science and techniques' is its topicality and importance to medicine, health care, and medical techniques.

Guidebooks to the medical literature are another type of selective bibliography. As a rule they supply information on how to carry out independent bibliographic investigations.

Selective bibliographies thus occupy an important place in the system of provision of information on medical literature, and they are of great help to practitioners and higher-grade medical auxiliaries in their work.

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V

problems in the compilation of a world list of pharmacy periodicals

T. Andrews

In February of 1963 the American Society of Hospital Pharmacists published a 'World List of Pharmacy Periodicals' (Andrews, 1963) in their journal. This listing was first initiated in 1957 by Miss Winifred Sewell, now head of the Drug Literature Program, National Library of Medicine, for the Fédération Internationale Pharmaceutique.

When work on the 1963 revision which I compiled began, it was hoped that rather complete examination and verification of each title could be accomplished through co-operation with other librarians. This hope was fulfilled in part by working with members of the pharmaceutical divisions of the SLA and the MLA as well as the staff of the library then called the Midwest Interlibrary Center (now the Center for Research Libraries), the NLM Technical Services Staff, the Librarian of the Pharmaceutical Society of Great Britain, and a number of others. It is hoped that for future revisions co-operation can be obtained from an even greater number of interested librarians in countries outside the U.S.A.

It was found that a great many titles which were listed in the various sources used were not available in the U.S.A. at all and verification was difficult if not impossible. Items not verified were marked with an asterisk and included in the listing anyway, and a number of entries were left incomplete where the information was not available. Listing of the periodicals published outside the U.S.A. was certainly not as complete as one might hope. Coverage was difficult because the compilers did not have ready access to the literature of other countries. It is hoped that this can be remedied in a revision through more adequate co-operation.

It should be said that an attempt was made in the 1963 list to include *all* periodicals related to the pharmaceutical sciences, even newsletters and other ephemeral items. Annuals and house organs were included. The subject matter of the journals selected included formulation, analysis, manufacturing pharmacy, retail pharmacy, hospital pharmacy, pharmacology, pharmacognosy, and some related materials in the soap, perfumery, and cosmetics fields. However, clinical journals and those devoted exclusively to chemistry were excluded, even if they did occasionally publish pharmacology papers. The list consisted of 935 titles, and an index by country was included.

The information given for each entry in the list was: title; name and address of publisher; frequency of issue; type of periodical, such as abstracts or reviews; business or professional; documentation; historical; listing of new drugs; news; official or legal; or scientific. Also included were sources in which the journals were indexed or abstracted, such as *Chemical Abstracts*, *Biological Abstracts*, *Index Medicus*, etc. If the journal had been discontinued at the time the list was published, this was always indicated. A great many titles were included as references that were, at the time of listing, being published under changed titles. This, too, was indicated.

No attempt was made to establish standard abbreviations for journal titles, nor does this seem to be a feasible objective at this time in view of the work done by a

USASI subcommittee of Sectional Committee Z39 on standardization in the field of library work and documentation.

For those who may not be familiar with this work, I will digress a bit. Committee Z39 is organized under the procedures of USASI and sponsored by the Council of National Library Associations. The Z39 Subcommittee on Periodical Title Abbreviations was organized in December 1961. From lists of title-word abbreviations furnished by *Index Medicus*, *BA*, *BOA*, *CA*, and some other abstracting publications, a list of periodical title words that are frequently abbreviated was compiled, making use of punched card equipment. Thus, the abbreviations adopted were based upon current use practices. The Subcommittee completed its work and submitted the standard to Section Committee Z39 early in 1963. The standard was given final approval as an American Standard for Periodical Titles Abbreviations in November 1963. The development of this standard was made possible by grants received from the NSF and the Council on Library Resources. A large number of library organizations are represented in this council. It should be pointed out that this standard does not consist of a list of journals with abbreviations. It merely includes the abbreviations of words frequently found in journal titles and some general rules for abbreviating A revised and enlarged word-abbreviation list has been published by the National Clearinghouse for Periodical Title Word Abbreviations (USASI, 1966). Quarterly supplements to the list are being issued and there are said to be subscribers from eight different countries (Richter, 1968)

In spite of this, there appears to be no international agreement yet on title abbreviations. A supplement to the third edition of *World Medical Periodicals* which has recently appeared was issued instead of a new edition because it was hoped that, given a bit more time, international agreement would be reached and then a fourth edition could be produced.

The aforementioned work by Committee Z39 should not be confused with the American Society for Testing Materials' work *Coden for Periodical Titles* (Kuentzel, 1966-8). This is another work by another standards organization and has a different purpose. The *Coden* abbreviations contain only five letters and are used in connection with computer-based systems. The periodical title abbreviations being referred to are used in writing references and in bibliographies.

While it is obvious that no attempt should be made to establish abbreviations for periodical titles in the field of pharmacy, it would be possible to include in a list those already established by USASI and the Council of National Library Associations in a revised 'World List of Pharmacy Periodicals'.

In revising the world list it may prove advisable to include other additional information that was not given in the 1963 list. For instance, some clues as to the quality of the publications might be listed; annotations could be included indicating special features; and perhaps most important, an attempt at a 'union list' approach might be made and notes of the holdings of co-operating libraries included. This last is most important, of course, as it would determine where to ask for interlibrary loans or facsimile copies. Also language or languages might be indicated, date of the first volume, price, and there are other useful possibilities.

The compilers and contributors of the original list felt that it was an important

step in the study and evaluation of the world's periodical literature in the pharmaceutical field. It was also an indication of the magnitude of the drug literature. This is evidenced by the fact that the list was reproduced in its entirety in August 1963 in a Committee Print of the 88th Congress, First Session, of the United States in a report prepared for the study of 'Interagency Co-ordination in Drug Research and Regulation' by the Subcommittee on Reorganization and Internal Organizations of the Senate Committee on Government Operations. The title of the report was 'A Factual Survey on the Nature and Magnitude of Drug Literature' and it was prepared by the National Library of Medicine. This was the committee chaired by Hubert H. Humphrey, former Vice-President of the United States, who was then a senator. So it seems likely that this publication was of at least some influence in gaining federal support for medical libraries in the U.S.A.

A profession's periodical literature is an excellent source of information through which its growth can be traced, trends are made evident, and new patterns in the reporting of a profession's achievement and discoveries emerge. It would be interesting to see how the literature has grown in the years since 1963. Trends might be noted, such as relative number of journals in the various branches of the pharmaceutical sciences. The number of discontinued and new journals could be noted and what areas they cover. For instance, it is likely that literature on clinical experience with drugs is growing. Drug literature, like other scientific literature, is international in origin and use. Therefore, international teamwork is essential in dealing with the problems of the literature. Drug literature is growing rapidly in size and is becoming increasingly complex because it is becoming more interdisciplinary and interprofessional in nature. This should be taken into consideration when compiling a revision of the list.

The 'Index by Country' of the 1963 list shows that periodicals were included from 64 different countries of the world. The largest number of the total 935, as might be expected, were from the U.S.A. with 205 titles; next came Germany with 51, France with 50, Japan and Italy each with 32, and the U.K. with 29. From 20 countries only one title each was listed. Undoubtedly, many titles were missing in this first listing. Some response was received to the appeal in the preface for readers to send in additions and corrections. Relatively few were received, however, in spite of the fact that it seems likely that the list had rather wide distribution, judging from the number of requests for reprints that were received from distant places.

Problems of communication arise in preparing such a list. There is the problem of distance, and most of all there is the problem of language. Native-born Americans are seldom fluent in any language but their own. We are fortunate at the universities, however, in having rather large number of graduate students and some faculty from distant lands who are of great assistance. Translations of communications in most languages can be obtained. Answering in another language presents greater difficulty.

In compiling the 1963 world list, use was made of the lists of holdings furnished by a number of libraries. These were rather useful, although some were a bit out of date. It is hoped that, since computer-prepared lists have become somewhat commonplace, more up-to-date lists will be available now.

Some interest had been expressed in publishing a new revised list of pharmacy periodicals. It is hoped that work on this can be begun next year. There are a number

of agencies in the U.S.A. which would be willing to co-operate, such as the library and pharmaceutical associations and schools of pharmacy.

At this time I should like to appeal to the interested librarians at this Congress to volunteer assistance in this project, particularly in such matters as making your lists of holdings available and in verifying titles. We now have available a *World Directory of Schools of Pharmacy* (WHO, 1966) which should prove very useful in making contacts with librarians at schools. However, I would still appreciate your getting in touch with me to volunteer assistance and give suggestions.

references

ANDREWS, T. (1963), World list of pharmacy periodicals. *Amer. J. Hosp. Pharm.*, 20, 41.
KUENTZEL, L. E. (1966-8), *Coden for Periodical Titles*, 3 v. American Society for Testing Materials, Philadelphia.
RICHTER, A. J. (1968), Communication to the SLA.
USASI (1966), *Revised and Enlarged Word-Abbreviation List for USASI Z39.5-1963 American Standard for Periodical Title Abbreviations*. National Clearinghouse for Periodical Title Word Abbreviations, Columbus, Ohio.
WHO (1966), *World Directory of Schools of Pharmacy*. Geneva.

VI

observations on some veterinary periodicals

I. Katić

I should like to call attention to some observations based on four years of experience in a research library. Most of the points apply to journals received by the Danish Veterinary and Agricultural Library, Copenhagen, *i.e.*, journals within the veterinary and agricultural field. My remarks may be of a technical rather than scientific nature, but they are nevertheless of importance to the staff of the library, the borrowers, and the editors.

The *names of journals* should offer no possibility of misunderstanding. Today there are, at any rate, seven journals called *Veterinaria*. Suppose a borrower orders *Veterinaria* 1966; then we shall have to guess whether the *Veterinaria* concerned is from the U.S.S.R., Yugoslavia, Czechoslovakia, Italy, Portugal, or Argentina. Suitable names might perhaps be *Veterinaria sovietica*, *Veterinaria jugoslavica*, etc., as the Italian journal is called *Veterinaria italiana*. *Genetica ('s-Gravenhage)* and *Genetika (Moskva)* or *Nature (London)* and *Nature (Paris)* are also bound to create confusion.

In preparing their lists of references our students and others sometimes ask us which *list of abbreviations* is 'official': *World List of Scientific Periodicals*, *Chemical Abstracts' List of Periodicals*, or *World Medical Periodicals*. We usually advise people to use any standard type of abbreviations they prefer, but to avoid self-made abbreviations. What would, for example, *A.* mean? *B.* might stand for *Bulletin*, *Berichte*, *Bilag*, and many other things, *Z.* for *Zeitschrift*, *Zeitung*, or *Zentralblatt*. It would be useful to have the abbreviated name on the cover of each journal or inside, appearing so conspicuously that the reader would find it obvious to use this abbreviation rather than making up one himself. Abbreviations that are easily understood in one country may cause many difficulties elsewhere.

The *names of foreign journals* are sometimes awkward, as, even by using a dictionary, one does not always realize what journal is concerned. Therefore, for instance, on the inside cover the title should be translated into one of the major world languages. The journals should never be thus catalogued, for the translation is only intended to serve as a guide to the library staff and borrowers. The same is valid for books.

It might seem superfluous to mention that the *cover title* and the *back cover title* should correspond to the title page title, but often the cover title or that on the back has differed from the one on the title page, and the wrong designation quoted as a reference.

We welcome the tendency in periodicals to abandon dating by school year, financial year, etc., and to use *calendar year* only. The quotation of 'p. 325/1925' might mean page 325 of the volume for 1924/1925 or 1925/1926.

We are against the impractical *Roman numerals*. They are fine when less than ten volumes are concerned, but the higher the number, the greater the risk of errors. Several journal editors have realized this and discontinued using Roman numerals

after the first ten or twenty volumes or at a later stage. It is also problematic to state volume numbers in letters instead of figures *(Annales de l'Institut Pasteur, Vestnik sel'skochoziaĭstvennoĭ nauki)*. The library staff and the bookbinder do not necessarily understand French or Russian, while we all may be expected to understand Arabic numerals.

I respect the sense of *attractive lay-out* on the part of technical editors, but occasionally it is desirable to make certain notes on the cover: date of receipt, classification or shelving designation, the stamp of the library or the owner, and the like. This is not possible on very dark covers.

For the purpose of shelf organization for loose copies, the *cover colour* might be changed each year. Another possibility would be to vary the height of the type of the spine or to use small symbols on the spine (asterisks, triangles, circles) in a displaced system. Unfortunately, there are too few technical editors using this method. Many journals even have an absolutely blank spine.

Today, there are still quite a number of journals without *current pagination*. If a borrower wants a photocopy of page 5 of *Veterinaria (Moskva)* 1966, we do not know whether the January, December, or one of the ten intermediate issues is concerned. The current pagination should comprise all pages with text. For example, in my bibliography (1969) I had to state: 'The unpaginated leaf between pages 275 and 276'.

Individual articles should not have excessively *long titles*, but they must imply something essential about the subject matter of the study. How many authors, I wonder, know that their publications are mentioned in national and international bibliographies and in technical bibliographies? If they knew, I hope they would never have used titles like 'What now?', 'Where do we stand today?' or 'A bitter remark'. Such articles can only be catalogued under 'Miscellaneous' — to be hidden and forgotten forever. When entitled, for instance, 'Organizing problems', the article would be filed under 'Organizing' and thus allow for later reference.

When dividing up a very long article into several short ones, or in case of a *series of articles* naturally belonging together, the later articles should always indicate exactly where to find the preceding articles.

A title should not be printed in *capitals*. Imagine the typists who, at a later stage, have to copy these titles, and the trouble they will have trying to decide whether to use capitals or not, *e.g.*, in the following: Cytoplasmic conversion of Na-dimethyldithiocarbamate to its S-beta-D-glucopyranoside in *Beta vulgaris L.*

The *names of authors* should preferably be in the nominative and written in full. For instance, V. Novikova may be the feminine nominative or the masculine genitive of Novikov. As it is in some countries customary to put the first name last, it is self-explanatory why there are journal articles to be found registered under names like Joseph, Stephan, Simon, etc. It also gives rise to misunderstanding if the surname is André or Jean. Here it would be advantageous to write the surname in capitals.

Research workers have to contact each other. A directory has recently been published containing 125,000 names and addresses of scientists. To provide a possibility of contact with the author, it is important that either his *address* or that of his institution is added. The editor of the journal should also state his own address in a

comprehensible way. One should shy away from using addresses like BAN, ČSAZV or VIEV, which may be difficult to understand even for the native postal authorities.

Unfortunately, in some countries *reprints* are still unknown. But even in countries where they are known, the provision of reprints should be made with more responsibility. They should not deviate from the original. If the reprints bring amendments, omit illustrations, or change the original pagination, they are not suitable for bibliographic work.

Where doctors' theses are concerned, a brief *curriculum vitae* should be given. Doctors named, for example, Schmidt or Smith may easily be confused, in spite of correct spelling of both the first and the second names.

Many of the points raised are really not the concern of authors but should be dealt with by the *editor*. How and to what extent a journal article may be used in due course depends largely on the way in which the article is catalogued. There is no definition available of the ideal catalogue, but the standard requirements should be an *alphabetic author index* and a *subject index*. Where less extensively known languages are concerned, it is desirable to have tables of contents translated into one or more of the major world languages, and this furthermore applies to designations like year, volume, issue, month, names of institutions, etc.

A problem in our daily library work is the many *altered titles* of journals. No matter how well-founded it may be, no alteration should be carried out without notice. The same applies when a journal is discontinued and possibly is re-issued under a different name. Such alterations should be announced in the last three volumes of the original journal. Many changes in size and typographic revisions have appeared, particularly in recent years, and we appreciate this, but it should not be necessary to change size during a running year; we even find this absolutely unacceptable.

It is recognized that the library is only an intermediary between borrower and author, and cannot demand any change of certain 'established' rules. I have only tried to draw attention to the experiences and difficulties encountered in the daily library routine. The rapidly increasing number of publications create problems that have never existed before. To be a good scientist does not necessarily mean that one is also a good author, editor, reviewer, or borrower.

Many difficulties and misunderstandings could be avoided if borrowers gave more complete and correct details from lists of references. They cannot be expected to know that there are 6 or 7 journals under the name of *Veterinaria*, or that the library catalogue gives 200 authors named Schmidt, but actual mistakes must be avoided.

I hope this paper will contribute to a closer co-operation and better understanding between the interested parties and add to the solution of some of these problems.

reference

KATIĆ, I. (1969), *Bibliography of Literature on Johne's Disease (Paratuberculosis) 1895-1964.* Copenhagen.

investigation at the molecular level as a new perspective in medicine: an annotated list of biochemical and biophysical publications suggested for a medical library

M. Magliola

A library in line with the frontiers of modern medicine must reflect the new trend of describing the organism as a temporal and spatial concatenation of chemical reactions. The recent advances in molecular biology, and chiefly the elucidation of the mode of action of informational macromolecules, have had a widespread echo resounding in studies of the transfer of the chemical behaviour of the simplest organism to complex processes such as growth, hormone action, and mental function in human beings. All living matter is assumed to be a theoretical extrapolation of single cells subjected to molecular changes and energy transformations. The crucial point of biomedical research is the relationship between molecular balance in the cell and the pathological condition. This suggestive approach results in two main working pathways: the study of chemical entities as aetiological factors in a chain of events leading to a physical abnormality, and the search for a syndrome which may be the logical and unquestionable consequence of some known dysmetabolism at cellular and subcellular level.

Hence, this new point of view, critically weighed and harmonized with the more classical clinical and pre-clinical disciplines, must be adequately represented in a modern medical library. The number of articles of a biochemical and biophysical nature is now very conspicuous and, therefore, to suggest a list of publication on the matter which may be suitable for a rather small medical library seemed a useful work. An attempt has been made to offer adequate bibliographic sources and to show research workers how to use chemical concepts in order to gain an insight into the functioning of living things. The published research information in biochemistry and biophysics is spread and dispersed among innumerable journals, monographs, and reviews. To select literature in these fields is not an easy task. Biochemistry and biophysics are interdisciplinary sciences which rely on the basic concepts of chemistry and physics, and occupy a key position among the classical life sciences, unifying them all. They constitute the meeting ground for the biologist, physiologist, cytologist, geneticist, and clinician, and offer the basis upon which life in health and disease can be properly understood. In the working life of most researchers there is the frequent necessity to move from one area of investigation to another, and one line of research often leads to neighbouring fields. In this context, this means that the research worker must find in his library not only up-to-date publications but also advanced textbooks of a less detailed character and works in the classical channels of research. This further implies that some well-known multidisciplinary periodicals with a much wider distribution than the specialized ones must be available.

The list does not pretend to be an exhaustive one. Defined subject areas, such as biology, physiology, cytology, microbiology, genetics, ecology, and pharmacology,

have not been considered methodically and have been included only when they obviously shade into biochemistry and biophysics. This is only a guide with the aim of keeping the library up to date on these topical subjects in very rapid development, without burdening the shelves too much. Thus, a very few textbooks, some periodicals, and a number of review articles, which represent the most commonly used sources of both background information and key references, have been mentioned. Specific monographs are omitted: they may be cited more authoritatively in specialized bibliographies and, in any case, are far away from the purposes of this list, which is intended as a reference tool for librarian and scientist to move in a less familiar field.

periodical list

journals

Biological Abstracts. Philadelphia, Bioscience Information Service, 1926-, semimonthly.
An important and comprehensive bibliography for literature in biomedical sciences. Beginning with 1962, each issue with a permutated title index and an author index, both cumulated annually.

News on Russian Medicine and Biochemistry. London, Heyden & Sons, 1968-, monthly.
Bibliographic journal reporting abstracts of Soviet contributions to medicine, biochemistry, and biophysics.

American Journal of Physiology. Bethesda, American Physiological Society, 1898-, monthly.
Includes several papers on the borderline between physiology and biochemistry.

Analytical Biochemistry. New York, Academic Press, 1960-, monthly.
Publishes articles on methods of purification, characterization, and isolation of biological substances, and on qualitative and quantitative techniques and instrumentation.

Annals of New York Academy of Sciences. New York, The Academy, 1823-, irreg.
Non-specialist journal publishes full length papers, often in the form of symposia on particular subject matter.

Archives of Biochemistry and Biophysics. New York, Academic Press, 1942-, monthly.
Reports contributions of biochemical and biophysical nature submitted for rapid publication. Includes short communications.

Biochemical and Biophysical Research Communications. New York, Academic Press, 1959-, monthly.
Colloquially known as 'bio-quick'. Specialized in the accelerated publication of usually short reports on original contributions to biochemistry and biophysics.

Biochemical Genetics. New York, Plenum Press, 1967-, quarterly.
Papers dealing with the molecular aspects of genetic variation and evolution, population ecology, gene action, immunogenetics, and somatic cell genetics.

Biochemical Journal. London, Biochemical Society, 1906-, monthly.
Publishes papers in all fields of biochemistry, provided that they describe results which made a contribution to knowledge or new methods applicable to biochemical problems.

Biochemical Medicine. New York, Academic Press, 1967-, monthly.
This international journal, with a very authoritative editorial board, publishes papers on biochemical aspects of medicine.

Biochemical Pharmacology. Oxford, Pergamon, 1958-, monthly.
An international journal devoted to the study and development of biologically active substances, and to research on their mode of action at the biochemical and subcellular level.

Biochemische Zeitschrift (European Journal of Biochemistry). Berlin, Springer, 1906-, monthly.
An old biochemical journal of high standard now adopting the bilingual format to surmount language difficulties.

Biochemistry. Washington, American Chemical Society, 1962-, monthly.
Its aim is to publish the results of original research in all areas of fundamental biochemistry, results that generate new concepts and experimental approach.

Biochimica et Biophysica Acta. Amsterdam, Elsevier, 1947-, weekly.
One of the most important biochemical and biophysical journals of the last 15 years. Papers in the following separately published sections: general subjects, bioenergetics, protein structure, enzymology, biomembranes, lipids, nucleic acids, proteins.

Biofizika (Biophysics). Oxford, Pergamon, 1957-, bimonthly.
The Soviet biophysical journal in its English translation.

Biokhimia (Biochemistry). New York, Consultants Bureau, 1956-, quarterly.
English translation of noteworthy Soviet journal devoted to general biochemistry.

Biophysical Journal. New York, Rockefeller Institute Press, 1960-, bimonthly.
Devoted entirely to biophysical aspects of life sciences.

Biopolymers. New York, Interscience, 1963-, bimonthly.
Experimental and theoretical reports on original research on the structure and function of biopolymers, synthetic analogues of biopolymers, biosynthetic pathways of polymer formation, biological organization, and genetic investigations.

Bulletin de la Société de Chimie Biologique. Paris, Masson et Cie, 1914-, monthly.
Covers all aspects of biochemistry through original memoirs, colloquia, and short notes of theoretical and experimental nature.

Cell and Tissue Kinetics. Oxford, Blackwell, 1968-, quarterly.
Encloses studies of kinetics at cellular level and those aspects of molecular biology that are concerned with the dynamics of cell multiplication and differentiation through regulatory systems.

Clinica Chimica Acta. Amsterdam, Elsevier, 1956-, monthly.
Papers reporting original experimental research, reviews of recent developments, and brief notes in the field of clinical chemistry in its broadest sense. Reports of clinical character are accepted only if the chemical, biochemical, or immunological techniques have played an important part in the work.

Experientia. Basel, Birkhäuser, 1945-, monthly.
Journal of pure and applied science which includes biochemical and biophysical reports.

FEBS-European Journal of Biochemistry. Amsterdam, North Holland, 1966-, monthly.
Publishes original contributions in biochemistry, biophysics, and molecular biology from European and other countries.

FEBS Letters. Amsterdam, North Holland, 1968-, monthly.
For the rapid publication of short reports on biochemistry.

Hoppe-Seylers Zeitschrift für Physiologische Chemie. Berlin, De Gruyter, 1877-, monthly.
The oldest organ in this discipline, publishes original experimental papers on all fields of descriptive and dynamic biochemistry, broadly surveying all aspects of modern fundamental biochemical principles.

Journal of Biochemistry. Tokyo, Tokyo University, 1922-, monthly.
Devoted to publishing original papers in the field of biochemistry. In the English language.

Journal of Biological Chemistry. Baltimore, American Society of Biological Chemistry, 1905-, semimonthly.
Publishes original biochemical research of high standard in the following sections: chemistry and metabolism of macromolecules, chemistry and metabolism of substances of low molecular weight, oxidation-reduction and bioenergetics, enzymology, control mechanisms and biochemical genetics, communications.

Journal of Cell Biology. New York, Rockefeller University Press, 1955-, monthly.
Reports original observations on the behaviour, structure, and function of cells and cell products, with particular emphasis on the discoveries arising from the application of modern techniques. Occasionally presents timely and comprehensive review articles.

Journal of Molecular Biology. New York, Academic Press, 1959-, monthly.
Papers on the nature, production, and replication of biological structure at molecular level and its relation to function. Occasional review articles.

Journal of Theoretical Biology. New York, Academic Press, 1961-, monthly.
Papers include generalized theories, theories of specific processes or phenomena, theoretical discussions of specific projects and methods.

Metabolism: Clinical and Experimental. New York, Grune & Stratton, 1952-, monthly.
Devoted to clinical and experimental studies in the field of metabolism in view of their application to clinical practice, diagnosis, prognosis, and therapy in almost every branch of medicine.

Molecular and General Genetics. Berlin, Springer, 1908-, irreg.
Continuation of the *Zeitschrift für Vererbungslehre,* the first journal on genetics.

Nature. London, Macmillan, 1868-, weekly.
International journal of science. Papers on physical and biological sciences are for the most part published in the form of short communications, but full length papers are also reported.

Photochemistry and Photobiology, Oxford. Pergamon, 1962-, monthly.
An international journal that publishes original papers, reviews, and notes in all branches of photobiology and in the photochemistry of substances of interest to photobiology. No papers dealing with ionizing radiations.

Proceedings of the National Academy of Sciences. Washington, The Academy, 1915-, monthly.
Publishes promptly first announcements of the results of original research by members of the Academy and others. Includes papers on physical and biological sciences and now is an authoritative source of genetic works.

Proceedings of the Royal Society. Series B: Biological Sciences. London, Royal Society, 1905-, irreg.
Publishes scientific research, in the form of papers, lectures, and discussions, presented by a Fellow or foreign Member of the Society.

Proceedings of the Society of Experimental Biology and Medicine. New York, Academic Press, 1903-, monthly.
Journal which accounts for a substantial percentage of the world's biochemical papers in the field of medical biochemistry.

Science. Washington, American Society for the Advancement of Science, 1883-, weekly.
Multidisciplinary journal which accepts papers for the presentation and discussion of important issues related to the advancement of science, including minority or conflicting points of view.

reviews and symposia

Advances in Biological and Medical Physics. New York, Academic Press, 1948-, annual.
Devoted to the application of physical tools to medical and biological research, and to the study of physical theories for the interpretation of metabolic events.

Advances in Clinical Chemistry. New York, Academic Press, 1958-, annual.
Its aim is to provide a readable account of selected important developments in clinical chemistry and of their impact upon the progress of medical science.

Advances in Comparative Physiology and Biochemistry. New York, Academic Press, 1962-, annual.
Includes articles of wide coverage, the chief emphasis being on comparative aspects and on the formulation of generalizations of overall biological specificity.

Advances in Enzyme Regulation. Oxford, Pergamon, 1963-, annual.
Devoted to the elucidation of factors which regulate enzyme activity and synthesis in mammalian tissues under physiological and pathological conditions.

Advances in Enzymology and Related Subjects of Biochemisty. New York, Interscience, 1941-, annual.
Conceived as a publication of critical reports on enzymology, abutting on the borderland between physiology, chemistry, microbiology, physical chemistry, and genetics.

Advances in Metabolic Disorders. New York, Academic Press, 1964-, annual.
Annual reviews of dysmetabolic syndromes, their testing techniques, and their biochemical interpretation.

Advances in Morphogenesis. New York, Academic Press, 1961-, annual.
A review series intended to link up the various branches of biology that deal with development.

Annual Review of Biochemistry. Stanford, Stanford University Press, 1932-, annual.
Presents from year to year critical reviews of current developments in the major fields of biochemical interest by offering a systematic survey of the pertinent literature.

Annual Review of Genetics. Palo Alto, Annual Review Inc., 1967-, annual.
This review touches on systematic ecology and evolution at one end of the [illegible] and biochemistry and biophysics at the other, judging a topic only [illegible] to geneticists. The reviews of literature are asked to be critical rather than [illegible]

Biochemical Society Symposia. Cambridge, Cambridge University Press [illegible] Academic Press, v. 24-, 1948-, irreg.
Important reviews of selected topics published [illegible] on interesting aspects of modern biochemistry.

Biochimica et Biophysica Acta Library. Amsterdam, Elsevier [illegible]
Each book contains an updated and comprehensive [illegible] biochemistry or biophysics.

Cold Spring Harbor Symposia on Quantitative Biology. Cold Spring Harbor, N.Y., Cold Spring Harbor Laboratories, 1933-, annual.

Annual meetings of a selected group of specialists actively interested in a specific aspect of quantitative biology, with a major emphasis on genetics.

Current Topics in Bioenergetics. New York, Academic Press, 1966-, irreg.

The series will focus primarily on the molecular basis of biological energy transduction. It will also include discussions at higher organizational levels in areas in which the molecular approach is not yet feasible.

Current Topics in Developmental Biology. New York, Academic Press, 1966-, irreg.

Designed specifically as a meeting ground for critical review and discussion of current work on developmental processes in the context of today's interdisciplinary approaches and concepts.

The Harvey Lectures. Philadelphia, Lippincott, 1905/06-, annual.

Lectures dealing, from both experimental and theoretical points of view, with biological subjects of general interest.

International Review of Experimental Pathology. New York, Academic Press, 1962-, irreg.

Provides timely reviews of important problems in experimental pathology, stressing a broad interdisciplinary approach and current advances due to new knowledge in the fields of cell biology, biochemistry, molecular biology, statistics, and other fundamental areas.

Progress in Biophysics and Molecular Biology. Oxford, Pergamon, 1950-, irreg.

Initially entitled *Progress in Biophysics and Biophysical Chemistry*, each volume contains a series of review articles which cumulatively cover this whole branch of science.

Progress in Nucleic Acids Research and Molecular Biology. New York, Academic Press, 1961-, irreg.

Essays in circumscribed areas of nucleic acids and molecular biology by workers provided with an opportunity for more personal expression than is normally met in review articles.

Symposia of the Society for Experimental Biology. London, Cambridge University Press, 1947-, annual.

Reports on a wide range of biological topics, including biochemistry, biophysics, and instrumentation.

Theoretical and Experimental Biophysics. New York, Dekker, 1967-, annual.

A review series of biophysics on which the description of biological phenomena utilizes to best advantage the concepts and tools of mathematics, physics, and chemistry.

Topics in Medicinal Chemistry. New York, Interscience, 1967-, irreg.

A series of volumes on all important categories of medicinals; the essays also include a discussion of the biomedical aspects of each subject.

Vitamins and Hormones. New York, Academic Press, 1943-, annual.

Critical reviews dealing with vitamin and hormone topics, with respect to their chemical, biochemical, and pharmacological aspects.

book list

biochemistry and molecular biology

BALDWIN, E., *Dynamic Aspects of Biochemistry*, 5th ed. Cambridge, Cambridge University Press, 1967. 466 p.
One of the most successful university textbooks, brought up to date preserving its basic features: the concentration on general principles with only as many details as are required to illustrate and exemplify them.

BERNFIELD, P., *Biogenesis of Natural Compounds*, 2nd ed. Oxford, Pergamon, 1967. 1209 p.
A multi-author volume with the aim of offering a general view of current knowledge of the biogenesis of compounds important or abundant in nature.

FLORKIN, M. and STOTZ, E. H., *Comprehensive Biochemistry*. Amsterdam, Elsevier, 1962. 31 v.
An advanced treatise in biochemistry which assembles in a set of 31 books the following principal areas of the subject: physico-chemical and organic aspects of biochemistry, chemistry of biological compounds, biochemical reaction mechanisms, metabolism, chemical biology, history of biochemistry, and a general index.

GREENBERG, D. M., *Metabolic Pathways*, 3rd ed. New York, Academic Press, 1967-. 4 v.
Interpretive survey of the existing knowledge of the chemical steps in the metabolism of the constituents of major importance in living organisms, in the context of the advances in all facets of biochemistry.

KOSOWER, E. M., *Molecular Biochemistry*. New York, McGraw-Hill, 1962. 304 p.
The purpose of this work is to analyse the molecular transformations of biochemistry in terms of detailed chemical mechanisms derived from physical-organic studies.

MAHLER, H. R. and CORDES, E. H., *Biological Chemistry*. New York, Harper and Row, 1966. 872 p.
Attempts to provide a clear, thorough, and up-to-date treatment of the following areas of knowledge fundamental to biochemistry: physical chemistry of biomacromolecules, thermodynamics, kinetics and mechanisms of enzymatic reactions, subcellular organization of the intermediary metabolism of the major classes of chemical substances.

HAGGIS, G. H., MICHIE, D., MUIR, A. R., ROBERTS, K. B. and WALKER, P. M., *Introduction to Molecular Biology*. London, Longmans, 1965. 401 p.
A book intended primarily for advanced students in the biological and medical sciences interested in recent advances in biology at molecular level and assumed to have some background knowledge of physics and chemistry.

STEINER, R. F., *The Chemical Foundations of Molecular Biology*. Princeton, N. J., Van Nostrand, 1965. 450 p.
Emphasis on timely topics of intense research interest in the field of physical biochemistry. Intended for graduate students, it will prove useful to scientists in all fields allied to biochemistry.

biophysics

KLOTZ, I. M., *Energy Changes in Biochemical Reactions*. New York, Academic Press, 1967. 108 p.
A valuable small monograph for students and researchers interested in acquiring an insight into the fundamental concepts and simple calculation of biochemical energetics.

PULLMAN, P. and PULLMAN, A., *Quantum Biochemistry*. New York, Interscience, 1963. 867 p.
Written with the two-fold aim of showing biochemists how quantum mechanics can yield answers to problems of the structure and mode of action of the constituents of living matter and of providing quantum chemists with a general outline of the aspects of biochemistry in which their contribution may be useful.

SINGER, E. P., *Biological Oxidations*. New York, Interscience, 1968. 722 p.
A comprehensive single-volume treatise on biological oxidations, with emphasis on reaction mechanisms and on alternative hypotheses on controversial or unsettled problems.

WEST, E. S., *Textbook of Biophysical Chemistry*. London, Macmillan, 1963. 436 p.
A textbook of physical chemistry for students, stressing many points of elementary mathematics, physics, and chemistry pertinent to an understanding of the principles of biochemistry, medicine, and biology under consideration.

methods in biochemistry

GLICK, D., *Methods of Biochemical Analysis*. New York, Wiley, 1954-.
This current series is designed to meet the need to be abreast of the manifold experimental innovations and improvements in the field of biochemical analysis. The topics included are chemical, physical, microbiological, and, if necessary, animal assays.

MORRIS, C. J. O. R. and MORRIS, P., *Separation Methods in Biochemistry*. New York, Pitman, 1963. 887 p.
Collects descriptions of those methods of importance to biochemists which have been developed or undergone major refinements within the last few years.

OWEN, D. B., *Handbook of Statistical Tables*. Oxford, Pergamon, 1962. 592 p.
A series of statistical tables in a form suitable for both constant and occasional users.

molecular and biochemical aspects of medicine

BITTAR, E. E. and BITTAR, N., *The Biological Basis of Medicine*. New York, Academic Press, 1968-. 6 v.
This work aims at providing a balanced treatment between contemporary medical science and the applications of cellular biology in medicine.

EIDUSON, S., GELLER, E., YUWELA, A. and EIDUSON, B. T., *Biochemistry and Behavior*. Princeton, N.J., Van Nostrand, 1964. 600 p.
An extensive review of the literature covering the interrelation between biochemistry and behaviour, and describing those biochemical systems affecting behavioural function with a discussion of the concepts which underlie them.

SODEMAN, W. A., *Pathologic Physiology. Mechanisms of Disease*, 4th ed. Philadelphia, Saunders, 1967. 1051 p.
An attempt to reach deeper into subcellular mechanisms and to promote a greater understanding of how and why symptoms of disease appear.

single topics of fundamental interest in biochemistry

Carbohydrates

STACEY, M. and BARKER, S. A., *Carbohydrates of Living Tissues*. Princeton, N.J., Van Nostrand, 1962. 232 p.
Aims to help the pathologist gain an insight into chemical changes that take place in living tissues during disease.

Lipids

DAWSON, R. M. and RHODES, D. N., *Metabolism and Physiological Significance of Lipids* New York, Interscience, 1965. 657 p.

This volume, which reports the proceedings of a study course, represents an attempt to formulate a balanced view of the subject as a whole, with all its relations with almost every branch of the biological sciences

Nucleic acids and molecular genetics

CHARGAFF, E. and DAVIDSON, J. N., *The Nucleic Acids: Chemistry and Biology.* New York, Academic Press, 1955. 3 v.

A co-operative treatise that represents a milestone in the study of nucleic acids. It is ideally continued and updated by the review *Progress in Nucleic Acids Research and Molecular Biology.*

WATSON, J. D., *Molecular Biology of the Gene.* New York, Benjamin, 1965. 494 p.

An attempt to relate recent discoveries of molecular genetics to the basic problem of biology: the nature of cells and how they divide.

Proteins

NEURATH, H., *The Proteins. Composition, Structure and Function.* New York, Academic Press, 1963-. 4 v.

This new edition of a classical treatise updates previous structural studies and elucidates the mechanism of action of enzymes, hormones, antibodies, and cellular components in terms of the structure and properties of the constituent protein molecules.

Enzymes

BOYER, P. D., LARDY, H. and MYRBACK, K., *The Enzymes,* 2nd ed. New York, Academic Press, 1959. 8 v.

The overall aim of the treatise is to present fully the available information about enzymes and enzyme action on the molecular level.

COLOWICK, S. P. and KAPLAN, N. O., *Methods in Enzymology.* New York, Academic Press, 1955-. 8 v.

This well-known work aims to provide researchers in the field with laboratory directions for the preparation and assay of enzymes, for the preparation and determination of substrates, and for certain special techniques of particular use to the enzymologist. With the publication of the latest volume, selected editors have the major responsibility for the publication of individual volumes dealing with their areas of specialization.

Hormones

PINCUS, G., THIMANN, K. V. and ASTWOOD, E. B., *The Hormones.* New York, Academic Press, 1948-64. 5 v.

A multi-author treatise which covers all the physiological, chemical, biochemical, and experimental aspects of endocrinology.

Vitamins

SEBRELL, W. H., HARRIS, R. S., GYORGY, P. and PEARSON, W. N., *The Vitamins: Chemistry, Physiology, Pathology, Methods,* 2nd ed. New York, Academic Press, 1967-. 7 v.

In this edition special emphasis is given to the chemistry, biochemistry, and physiology of vitamins, since most of the recent advances have concerned these bio-disciplines. Curre knowledge concerning pharmacological and pathological aspects is also reported· of measurement and assay are considered in some detail in volumes 6 and 7.

VIII

the european translations centre as a source of information on foreign scientific literature

G. A. Hamel

It is vital to all scientists, wherever they live and whatever their subject fields, to keep up with the scientific discoveries of and progress made by their colleagues elsewhere. This becomes difficult, of course, when the scientists belong to different countries and lay down their scientific findings in languages with which others elsewhere are not familiar. In the Western world scientists may be, and usually are, familiar with English, French, and German and can easily read articles in these languages. Dr. Wood (1967) reports that 90% of English chemists can make sense of a French text and 60% can read a German text with the help of a colleague. However, familiarity with Russian and other Slavic languages, and more so with Japanese and Chinese, is fairly low.

Various statistics (UNESCO, 1957; Garrido, 1964) have been put forth concerning the use of various languages in scientific and technical literature. From these one may conclude that five languages (English, Russian, Japanese, French, and German) account for almost 80% of the world's written scientific knowledge. Japan's share — and the same is true for the U.S.S.R.— in written science has been greatly on the increase during the past two decades. In the fields of science and technology in general, the Japanese account for about 5% and the U.S.S.R. for about 14% of the world's output. It is fair to expect with the emergence of China as a world power that, quantitatively speaking, the scientific knowledge of this country will become of paramount interest to the rest of the world.

Although, as has been pointed out, a great deal of scientific literature is written in English, Western scientists need to read about scientific discoveries in other parts of the world where the languages might be totally unfamiliar to them. It is fairly obvious that a scientist cannot be familiar with all the languages of the world in which scientific literature is produced, so translations into languages with which he is familiar is a very important need. The problem then arises as to what has been translated and where the translation [illegible] be located.

A number of nc[illegible] periodicals are translated cover-to-cover entirely or in abstracted form, [illegible] 200 Western [illegible] exist which contain translations from various foreign [illegible]ding to [illegible]tion received very recently, the NSF in Washington [illegible] the [illegible] of 74 journals since 1957, with 67 of them being done [illegible] until [illegible]8. This equals a production about 1,000,000 [illegible] still being partially [illegible]). The output [illegible]ournals accounts [illegible]t 25,000 arti[illegible] of incidental [illegible] of articles [illegible]ustry in all [illegible] world. [illegible] of the large [illegible]cles that [illegible]ult to keep [illegible]y [illegible] they are [illegible]n occurs

because the existence of another translation of the same article is not known, thus incurring an undue waste of time and money.

To help overcome some of these difficulties mentioned, the need for a clearinghouse of scientific translations was obvious. To meet this need, a number of Western countries, under the auspices of the OECD and the encouragement of the U.S.A., agreed in 1960 to co-operate on the international level to create a system for the easy accessibility of translations of scientific works in languages considered difficult of access. This co-operation gave rise to the ETC, which is situated in Delft, The Netherlands. Apart from the 16 member countries (Austria, Belgium, Canada, Denmark, Federal Republic of Germany, France, Israel, Italy, Luxemburg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the U.K.), the ETC receives the co-operation of countries like India, Pakistan, Australia, New Zealand, Finland, South Africa, the Latin American countries, and the U.S.A.

The ETC is a documentation centre for translations and is not involved in the creation of the actual translations themselves. Its objectives, as laid down in its statutes, are: to encourage, improve, and facilitate the use of literature published in Russian and other less accessible languages which is of interest to science and industry, and therefore to promote international co-operation in this field. The main functions of the ETC are to collect translations, to build a central reference catalogue of this kind of document, to run an information bureau concerning available translations, and to give publicity to existing translations. The translations assembled and/or recorded may be in any Western language, but are primarily in English (50%), German (30%), French (15%), leaving 5% to all other languages. The translations are from languages considered difficult of access, namely: Russian (80%), other Slavic languages (8%), Finnish, Hungarian, Rumanian, Chinese, and Japanese (7%), Arabic and other (5%).

The Centre's collection of translations at the time of writing (the records comprise some 600,000 articles) is mainly from the U.S.A., through the U.S. Department of Commerce Clearinghouse for Federal Scientific and Technical Information. Through an agreement with the U.S.A., ETC receives all the Joint Publications Research Service translations in hard copy and microfilms, and microfiches of other U.S. government translations. Other countries also contribute translations in hard copy or microfiche, *e.g.*, France's Centre National de la Recherche Scientifique, Japan's Atomic Energy Research Institute, and Canada's National Research Council.

An information service on the existence of translations which is run by the ETC is provided free of charge to inquirers. The Centre has built up its large reference card catalogue by title of original periodical as well as by author. Requests that cannot be located in these catalogues are sent by telex to the NLL in the U.K. and the Institut für Dokumentation in East Berlin to see if they can be located there. The ETC observes a strict 24-hour time limit on all incoming requests. It handles about 1,000 requests a month. Similar figures are reported by the U.K., U.S.A., France, and Germany. Reproductions of translations held by the Centre are provided at cost price. There are also a limited number of monographs available on loan.

In order to carry out the publicity of existing translations to the best possible extent, the Centre produces three publications which are in themselves useful tools for

scientists and others who are interested in discovering whether a particular translation they are interested in exists. First, I will mention the semi-monthly *List of Translations Notified to ETC.* Citations in this publication (some 500 per issue) are arranged according to the COSATI classification system and give the authors and titles of individual translated articles or monographs. Translations quoted in the *List* have not been previously cited in any national lists, *i.e.*, the lists of centres of co-operating countries such as *NLL Translations Bulletin* (U.K.), *Catalogue Mensuel des Traductions* (France), and the monthly *Neu eingegangene bzw. gemeldete Uebersetzungen* (German Federal Republic). ETC is strongest in fields such as materials, engineering, chemistry, earth sciences, and has also a fair collection of information on biological and medical sciences.

Since the announcement lists (national and ETC) do not have an index, the ETC produces a second publication called *World Index of Scientific Translations.* This is a general citation index published quarterly which lists the world's production of translations from difficult languages into Western languages, chiefly English, French, and German. The fourth issue appears as a cumulative index of the year's compilation, and gives access to approximately 50,000 translations. The *World Index* is essentially a finding list of translations of periodical articles and patents (both complete and in process), and gives one to three locations only.

The third publication produced by the ETC is a monthly bulletin titled *Information on ETC.* It is a liaison bulletin giving news on all kinds of translation activities, including the production of dictionaries, glossaries, etc.

The translations documented at the ETC are concerned with all fields of science and technology, including a fair number of social science translations. The catalogue is not classified by subject but by title of the original periodical publications, as has already been mentioned. However, in order to give those people who are interested in the field of medicine some idea of translations the Centre holds in this sphere, a survey of the Russian periodicals on medicine in the catalogue was undertaken. A total of 207 Russian periodicals relating to medicine was found. Of these, 13 are translated cover-to-cover or in some other regular way. For the guidance of the participants of this Congress, a list (see Appendix) has been prepared of the most frequently translated Russian periodicals (*i.e.*, of which the ETC holds more than 20 references each for the year 1967). Medical librarians may find the following two bibliographies published by HEW useful guides to their discipline:

U.S. Department of Health, Education and Welfare. National Library of Medicine. *Bibliography of Medical Translations, January 1959-December 1966.* Bethesda. (This bibliography republishes the translation listings which have been included in *Technical Translations* and its predecessor *Bibliography of Translations.* Arrangement by author; it includes an index by the original journal title and a patent number index.)

U.S. Department of Health, Education and Welfare. Public Health Service. National Institutes of Health Library. *NIH Library Translations Index 1954-1963* + annual supplements. Washington. (Arrangement according to author, no indexes.)

appendix

list of russian medical periodicals having translations filed in the etc catalogue

+ more than 20 translations published in the *World Index* 1967
o cover-to-cover translated periodicals

Akademiya Meditsinskikh Nauk SSSR. Institut Poliomielita Virusnykh Ensefalitov. *Trudy.*
+ o Akademiya Meditsinskikh Nauk SSSR. *Vestnik.*
Akademiya Nauk SSSR. Institut Vysshei Nervnoi Deyatelnosti. *Trudy. Seriya Fiziologicheskaya.*
Akademiya Nauk SSSR. Institut Vysshei Nervnoi Deyatelnosti. *Trudy. Seriya Patofiziologicheskaya.*
Akademiya Nauk SSSR Sibirskoe Otdelenie. *Izvestiya. Seriya Biologo-Meditsinskikh Nauk.*
Aktualnye Voprosy Eksperimentalnoi Klinicheskoi Terapii.
Akusherstvo i Ginekologiya.
+ o *Antibiotiki.*
+ o *Aptechnoe Delo.*
+ *Arkhiv Anatomii, Gistologii i Embriologii*
Arkhiv Patologii.
Azerbaidzhanskii Meditsinskii Zhurnal.
Bolshaya Meditsinskaya Entsiklopediya.
+ o *Byulleten Eksperimentalnoi Biologii i Meditsiny.*
Eksperimentalnaya Khirurgiya i Anesteziologiya.
+ o *Farmakologiya i Toksikologiya.*
Farmatsevtychnyi Zhurnal.
Farmatsiya.
o *Genetika.*
+ o *Gigiena i Sanitariya.*
o *Gigiena Truda i Professionalnye Zabolevaniya.*
Grudnaya Khirurgiya.
Institut Epidemiologii, Mikrobiologii i Gigieny, Leningrad. *Trudy.*
Institut Usovershenstvovaniya Veterinarnykh Vrachei, Leningrad. *Sbornik Nauchnykh Trudov.*
Institut Usovershenstvovaniya Vrachei, Tashkent. *Sbornik Nauchnykh Trudov.*
Kardiologiya.
Khirurgiya.
Klinicheskaya Khirurgiya.
Klinicheskaya Meditsina.
o *Kosmicheskaya Biologiya i Meditsina.*
Mediko-Biologicheskaya Stantsiya, Sukhimi. *Trudy.*
+ *Meditsinskaya Gazeta*
+ *Meditsinskaya Parazitologiya i Parazitarnye Bolezni.*
+ *Meditsinskaya Promyshlennost.*
+ *Meditsinskaya Radiologiya.*
Meditsinskaya Sestra
o *Meditsinskaya Tekhnika.*
Meditsinskii Zhurnal Uzbekistana.
Nauchno-Issledovatelskii Institut Epidemiologii, Mikrobiologii i Gigieny, Omsk. *Trudy.*
Nauchno-Issledovatelskii Institut Gigieny, Moscow. *Uchenye Zapiski.*
Nauchno-Issledovatelskii Institut Vaktsin i Syvorotok, Tomsk. *Trudy.*
Nekotorye Problemy Biokibernetiki, Primenenie Elektroniki v Biologii i Medi...
Nervnaya Sistema
Novoe v Zhizni, Nauke, Tekhnike. Seriya 8. Biologiya i Meditsina.
Ocherki Klinicheskoi Nevrologii.

Oftalmologicheskii Zhurnal.
Parazitologicheskii Sbornik.
Parazitologiya.
Pediatriya.
Problemy Endokrinologii i Gormonoterapii.
Problemy Gematologii i Perelivaniya Krovi.
o *Problemy Parazitologii.*
Problemy Tuberkuleza.
Protezirovanie i Protezostroenie.
Sanitarno-Gigienicheskii Meditsinskii Institut. *Trudy.*
Sovetskaya Meditsina.
\+ o *Sovetskoe Zdravookhranenie.*
Stomatologii.
\+ *Terapevticheskii Arkhiv.*
\+ *Tsitologiya.*
Urologiya.
Vestnik Dermatologii i Venerologii.
Vestnik Khirurgii.
Vestnik Oftalmologii.
Vestnik Rentgenologii i Radiologii.
Vodosnabzhenie i Sanitarnaya Tekhnika.
Voenno-Meditsinskaya Akademiya. *Trudy.*
\+ *Voenno-Meditsinskii Zhurnal.*
Voprosy Kraevoi, Obshchei i Eksperimentalnoi Parazitologii i Meditsinskoi Zoologii.
Voprosy Kurortologii, Fizioterapii i Lechebnoi Fizicheskoi Kultury.
Voprosy Meditsinskoi Khimii.
Voprosy Neirokhirurgii.
Voprosy Okhrany Materinstva i Detstva.
\+ *Voprosy Onkologii.*
Voprosy Psikhiatrii.
o *Voprosy Psikhologii.*
\+ *Voprosy Virusologii.*
Vrachebnoe Delo.
Za Sotsialisticheskoe Zdravookhranenie Uzbekistana.
Zdravookhranenie.
Zdravookhranenie Belorussii.
Zdravookhranenie Kazakhstana.
Zdravookhranenie Rossiiskoi Federatsii.
Zdravookhranenie Turkmenistana.
\+ *Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii.*
Zhurnal Nevropatologii i Psikhiatrii.
Zhurnal Vysshei Nervnoi Deyatelnosti.

references

GARRIDO, J. (1964), Scientific and technical publications in the lesser known languages, *Science East to West*, 5, 14.

UNESCO (1957), *Scientific and technical translating and other aspects of the language problem.* Paris.

WOOD, D. N. (1967), The foreign language problem facing scientists and technologists in the United Kingdom. *J. Docum.*, 23, 117.

bibliographic fugitives: papers presented at meetings

F. A. Meakin and R. F. Lewis

The fate of a paper presented at a meeting of biomedical scientists is subject to several kinds of bibliographic chance. It may or may not be published in full or in summary, and if it is published at all, there is no certainty that its existence will be noted by one of the indexing or abstracting services. If the paper ultimately appears in a journal covered by *Index Medicus*, *Excerpta Medica*, or a similar service, its place in biomedical bibliography is assured. On the other hand, if the same paper reaches print in the form of a separately published volume of proceedings, its identity may become exceedingly difficult to trace by ordinary library methods. Some observers of contemporary biomedical bibliography have expressed concern over the vagaries which surround the publication of proceedings as well as over the problem of retrieving information presented at scientific gatherings (Bishop; 1961; Cruzat, 1968; Darling, 1966; Lewis *et al.*, 1968; Symposium volumes, 1967).

Papers presented at meetings (PPM) often communicate the results of research and have other characteristics of journal articles, and therefore comprise important elements of science information exchange. The proceedings of certain recurring conferences, for example, those of the Cold Spring Harbor Symposia on Quantitative Biology and the Laurentian Hormone Conferences, are regarded as a part of journal literature and are regularly cited as such.

Cruzat (1968) and Orr *et al.* (1964) have pointed out that considerable effort and cost is being expended to announce forthcoming meetings and provide a measure of bibliographic control over PPM. *Proceedings in Print* and *Directory of Published Proceedings* (Interdok), and like publications, deal with symposia in an overall way, but fail to analyze the *content* of individual PPM. In *Chemical Abstracts* and *Biological Abstracts* there are found analytics for selected PPM in some subjects, but for both clinical and basic medical sciences, comprehensive and systematic coverage of these papers is lacking.

Proposals for better analysis of PPM have been made by Bishop (1961), who advocated a separately published index covering multi-author monographs as well as PPM, and Darling (1966), who as Chairman of the MLA-NLM Liaison Committee recommended: 'As quickly as possible NLM should include symposia, conference proceedings, and similar multiple-author works in MEDLARS and *Index Medicus*, this to take precedence over the indexing of additional journal titles'. More recently, Pizer (1967) has announced a computer-based program for indexing individual chapters of books, including symposia proceedings. Development of computerized approaches to these publications suggests the possibility of producing, as a by-product, a comprehensive index to PPM.

methodology

At the Biomedical Library of the University of California, San Diego, a survey has been conducted in an attempt to provide the basis for an opinion regarding the scope, substance, and value of monographic publications resulting from various types of biomedical meetings. The survey covered all 'fugitive' PPM received through an agreement with a designated book dealer, whereby the Library receives, on an approval basis, all English language publications of the major publishers of biomedical material. Publications received at the Library between July 1 and December 31, 1967, were screened for compilations which could be described as PPM. Proceedings appearing in journals or journal supplements were excluded from the study.

Over the six-month period, 157 conference proceedings were cataloged and processed for the survey. Of this group, 108 titles made up the final sample. Forty-nine titles were dropped from consideration because they were proceedings of recurring conferences regularly abstracted by one of the major abstracting services, or they had been previously published in the journal literature.

findings

Number of meetings analyzed by type of meeting

Symposium	61
Conference	24
Congress	11
Colloquium	3
Study group	1
Panel	2
Meeting	3
Seminar	1
Workshop	1
Discussion	1
Total	108

Publication intervals

Published in the same year as meeting	28
Published in the year following the meeting	46
Published two years after meeting	27
Published three or more years after meeting	7
Total	108

Number of papers presented at the meetings

Original	2263
Review	1192
Total	3455

Size of the printed proceedings

Under 100 pages	4
101-200	24
201-300	22
301-400	21
401-500	14
Over 500 pages	23
Total	108

Average length of papers: 11 pages

Indexes in volume

No index	42
Subject index only	31
Author index only	6
Both types of index	29
Total	108

analysis of eight conferences

The proceedings of eight specific conferences, comprising 135 papers, were systematically investigated in order to determine if, how, and when individual PPM were handled by major English-language bibliographic services.

Conference number	Abstract and indexing services searched	Papers in monograph	Papers abstracted	Papers indexed, no abstract
1	2	10	0	0
2	3	14	0	0
3	3	12	6	6
4	8	20	2	3*
5	4	10	5	2
6	8	10	5	1*
7	5	36	32	1
8	4	23	0	0
	Total	135	50	13

*These were not abstracts as published in the meeting's proceedings, but of the same papers published also as journal articles.

services consulted

Bibliography of Agriculture (BOA)
Biological Abstracts (BA)
Chemical Abstracts (CA)
Excerpta Medica (various sections) *(EM)*
International Abstracts of the Biological Sciences (IABS)

Nutrition Abstracts and Reviews (NAR)
Psychological Abstracts (PA)

conferences analyzed

1. HOPKINS, Philip, ed.
Principles of treatment of psychosomatic disorders; proceedings of a conference held by the Society for Psychosomatic Research at the Royal College of Physicians, London, Nov. 1962. Oxford, New York, Pergamon [c1965]. Ten papers.

Psychological Abstracts: v. 39, p. 1414, #12913, 1965.
Found under editor. Gives brief summary of contents. Symposium and its sponsorship are mentioned. Individual papers not indexed or listed.
Not in: *EM*, Section 8B.

2. MERIN, Joseph Harold, ed.
The etiology of the neuroses. [Palo Alto, Calif.] Science and Behavior Books [c1966]. Papers originally presented at a symposium sponsored by the Society of Medical Psychoanalysts, New York City, March 17-18, 1962. Fourteen papers.

Psychological Abstracts: v. 403, p. 967, #10268, 1966.
Found under editor. No information given on individual papers.
Not in: *EM*, Section 8B; *BA*.

3. Phytochemical Group Symposium, Aberystwyth, 1966.
Terpenoids in plants; proceedings of the Phytochemical Group Symposium, Aberystwyth, April 1966. Edited by J. B. Pridham. London, New York, Academic Press, 1967. Twelve papers.

Biological Abstracts: v. 48, p. 10204, #114653, 1967.
Found under editor. Summary of conference is given with the following statement: 'Abstracts of the articles will appear in appropriate sections of *Biological Abstracts*.' Eight papers found between Jan. 1 and August 15, 1968.

Chemical Abstracts: v. 67, p. 10775, #115523d, 1967.
Found under editor. Listing only. No mention made to symposium. All individual papers found under author between February 26 and March 25, 1968. Symposium cited.

Not in: *BOA*.

4. Gregor Mendel Memorial Symposium, Brno, 1965.
Proceedings of a symposium held in Brno in August 4-7, 1965. Edited by Milan Sosna. Prague, Academia, 1966. Twenty papers.

Biological Abstracts: v. 48(24), p. 10779, #119877, 1967.
Found under editor. Brief summary of papers with the following statement: 'Abstracts of articles in this volume will appear in appropriate sections of *Biological Abstracts*.' Five papers found; three indexed as separately published journal articles.

Not in: *CA*; *IABS*; *EM*, Sections 2A, 2B, 21, 22; *BOA*.

5. CHARLES, David, ed.
Progress in conception control, 1967. Third physicians' conference. A report of a scientific discussion held in Washington at the time of the 15th annual meeting of the American College of Obstetricians and Gynecologists, April 1967. Philadelphia, Lippincott [c1967]. Ten papers.

Biological Abstracts: v. 48(24), p. 10778, #119863, 1967.
Found under editor. Summary of conference is given with the following statement: 'Abstracts of the articles will appear in appropriate sections of *Biological Abstracts*.' Seven papers found.

Not in: *EM*, Sections 10,3; *CA*.

6. Symposium on Microbial Toxins, New York, 1966.
Biochemistry of some foodborne microbial toxins; papers presented at the Symposium on Microbial Toxins held at the meeting of the American Chemical Society, New York, Sept. 1966. Edited by Richard I. Mateles and Gerald N. Wogan. Cambridge, M.I.T. Press [c1967] Ten papers.

Biological Abstracts: v. 48(21), p. 9271, #104284, 1967.
Found under editor. Summary of conference is given and the following statement appended: '*Abstracts of these papers will appear in appropriate sections of Biological Abstracts.*' Five papers found.

Chemical Abstracts: v. 67(1), #528m; v. 68(15), #655982, 1967
Two papers found, both published as journal articles (one of them also found in *BA*).

Not in: *NAR*; *IABS*; *EM*, Sections 2B, 2C and 4; *BOA*.

7. Symposium of the Molecular Biology of Viruses, University of Alberta, 1966.
The molecular biology of viruses, proceedings of the Symposium held at the University of Alberta, Canada, June 27th to 30th, 1966, in conjunction with the Faculty of Medicine of the University of Alberta. Edited by John S. Colter and William Paranchych. New York, Academic Press, 1967. Thirty-six papers.

Chemical Abstracts: v. 67(25), p. 10790, #114588m, 1967.
Found under editor. Listing only. No summary. No mention of symposium. Thirty-two papers found.

Bibliography of Agriculture: v. 31(1), p. 97, #3401, 1967.
One paper found, published as a journal article.

Not in: *BA*; *EM*, Sections 2B and 4; *IABS*.

8. International Conference on Mechanisms of Salivary Secretion and their Regulation, Birmingham, Ala., 1966.
Secretory mechanisms of salivary glands; proceedings, edited by Leon H. Schneyer and Charlotte A. Schneyer. New York, Academic Press, 1967. Twenty-three papers

Chemical Abstracts: v. 68(1), p. 26, #346w, 1968.
Listing only. No summary. No papers found.

Not in: *BA*; *EM*, Sections 2A, 2B.

comparison of approaches to ppm

In *Biological Abstracts* the proceedings of a particular meeting are listed under an overall title, together with an announcement that 'Abstracts of articles in this volume will appear in appropriate sections of *Biological Abstracts*.' Unfortunately, there is a considerable delay between the posting of this note and the actual appearance of the abstracts. For instance, proceedings of the Phytochemical Group Symposium, held in

April 1966, were published in 1967, and *BA* announced the publication in its issue for December 1, 1967. The 8 papers were then abstracted sporadically between February 1 and June 15, 1968. As of this writing, four papers have not yet been abstracted.

Chemical Abstracts includes in its 'List of Periodicals Indexed' many recurring international and national conferences. The PPM are abstracted under subject categories appropriate to the subjects of the individual papers, and references are given to the published proceedings. Other meetings, especially symposia that are non-recurring, do not fare so well. Usually these are simply listed with no accompanying abstract. There is no indication as to whether the individual PPM are to be abstracted, and it is only through patient investigation that some of these papers are found. However, unlike *BA*, *CA* tends to bunch the abstracts into one or two issues thus cutting down considerably on search time.

Access to PPM through *Excerpta Medica* was found to be very difficult, due in part to the editorial policies of each of the sections. Cruzat (1968) states that only three sections include monographic meeting proceedings. Even within these three the treatment of these publications is varied. Meeting publications may be found under 'Miscellaneous' at the end of a volume or under 'General Subjects' in the front of a volume, or they may be found listed in the subject index and grouped accordingly. Among the different sections, the individual entries differ in the amount of information given. Some merely cite conferences without reference to individual papers, others include partial proceedings, while occasionally complete proceedings are provided.

Among the services that were investigated in this survey, *Psychological Abstracts*, *Bibliography of Agriculture*, and *Nutrition Abstracts and Reviews* were the least satisfactory in their handling of PPM. *BOA* is useful in the location of serial proceedings, but provides only minimal coverage of other meetings. One feature of *BOA* worthy of note is its corporate body index. *PA* makes no attempt, as far as we were able to determine, to abstract non-serial PPM under meeting title. The proceedings are listed under monographic title, usually with no reference to the meeting involved. Unlike *PA*, *NAR* did not seem to cover the monographic proceedings in any form.

conclusion

The findings of the survey lead us to the conclusion that bibliographic control of PPM is incomplete and inconsistent. It is our belief that the systematic search of the indexing and abstracting tools takes more time, patience, and ingenuity than the average researcher would be or could be willing to expend. The retrievability of an individual paper via *Index Medicus* depends entirely upon the bibliographic character of the vehicle which carries it, rather than upon its content or merit. If the paper appears in a journal supplement or in the proceedings of one of certain recurring meetings, it receives the same indexing accorded a journal article. If the same paper is published in the proceedings of a non-recurring meeting, it is excluded from *Index Medicus*. Similarly, PPM coverage by the leading abstracting services is approached on a selective basis, and the appearance of the abstracts in print is delayed.

The deficiencies we have noted in bibliographic control of PPM indicate an urgent need for a comprehensive, timely index to those proceedings which are outside

the scope of *Index Medicus*. We therefore suggest that a new retrieval instrument should be created to deal with the PPM problem. An *Index to Papers Presented at Biomedical Meetings* issued at least four times a year is needed by biomedical scientists and librarians. The approach we envision incorporates these features: meetings cited in some logical order using Anglo-American Cataloging Rules for the form of entry; individual papers listed under the main entry for the meeting, creating thereby a kind of Current Contents for PPM; code designations assigned to each meeting name and to the titles of individual papers, each entry having a unique designation; name and place indexes, and permuted title index or an arrangement using MeSH; and machine-readable records, utilizing the computer as much as possible. The following example illustrates the proposed index.

Code	*Entry*
PEPTE-000	European Symposium on Peptides, 5th, Oxford [Eng.] September, 1962, Proceedings. New York, Macmillan, 1963.
PEPTE-001	Kappeler, H. Methods of protection: an assessment of the present position. p. 3-13.
PEPTE-002	Dane, E. Ueber eine neue Art von Amino-Schutzgruppen. [Concerning a new *type of amino protection group.*] *Abstract only. p. 15.*
PEPTE-003	Gazis, E., Bezas, B., Stelakatos, G. C., Zervas, L. On the protection of alpha-amino and carboxyl groups for peptide synthesis. p. 17-21.
PEPTE-004	-----

PEPTE-039	Patchornik, A., Sokolovsky, M. Non-enzymatic cleavage of peptide chains at the cysteine and serine residues. p. 253-257.

explanation

The main body of the system would be an arrangement of the symposia according to the subject covered (in the example given, the alphabetizing word would be peptides). Titles of individual papers would then be listed thereunder, with each paper bearing a unique code number. Symposia covering more than one subject would be alphabetized under the first subject named, with references from any others. Several kinds of indexes could be prepared in order to provide access to the PPM: KWIC index based upon titles of individual papers, computer-generated; alphabetical index to the main entry used in libraries to catalog the meeting; author index; geographic index; chronological index; index to corporate bodies.

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syndromes difficult to find in the medical literature: a suggested project for biomedical librarians

E. F. Adkins

References on the rare, hard-to-find, or newly named syndromes constitute a collection which all librarians make, since this type of reference question arises very often. Why not pool our results for our mutual benefit? The approach to this type of information is involved, and is standardized by each of us in our own way. To show (or remind) you of the possible routines involved, I shall list the tools in the system which I have developed for coping with this type of reference question.

If the syndrome requested is not listed nor cross-referenced in MeSH, I go then to *Current Medical References* (Sanazaro, 1967) and on to the disease and syndrome tables in recent dictionaries such as *Dorland's* (1965) and Stedman (1966). Of course, the dictionaries do not give citations, but they give symptoms of the part affected, which gives one a starting point for returning to MeSH and eventually to *Index Medicus* or *Cumulated Index Medicus*. If our requesters are knowledgeable and articulate, they can supply other clues, such as those affected (fetus, child, or adult), the approximate date of publication of articles sought (such as 'last two years'), and some of the symptoms (the more specific, the better)

Should all these recent sources fail, then I go to older standbys, such as the 1960 *Encyclopedia of Medical Syndromes* by Durham, still unrevised though reprinted as recently as 1967. A still older volume is my favorite: *Encyclopedia of Medical Sources* by Kelly (1948). This, too, is unrevised according to its publisher's 1968 price list. Adequate revision of these two books is much needed. If the syndrome is still not found, there are still textbooks and yearbooks of the subject to search, as well as abstracts. When I finally run down a few references, I want to find them again easily in the future.

The way I selected to make this knowledge available to me and to our library patrons in the future is to make an analytic card for the card catalog and a duplicate of this card for a file I keep in my office, which I call – hopefully – 'Kelly Suppl.' This card is made and filed under the name of the syndrome, usually a proper name. Notes on these cards list the original article (if located, and especially if *we have* the publication) and one or more recent articles, preferably those of a review nature.

There seems to be a difference of opinion about the nature of a review. Alfred Soffer's recent editorial (1968) distinguishes articles with long bibliographies and a 'critical review'. He further refers to a *JAMA* editorial (The review – a creative synthesis, 1966) which calls a 'real' review a 'distillate' or a 'judgment'. We are all searching for this type, but I have not distinguished between the two in this case. In the library field the long bibliography affords additional references to my patron. This is particularly helpful in a small library, since we are looking for journal titles available in our library.

When I am sure of the medical entities, I also put subject cards in our catalog. So many syndromes, however, are multifaceted, and the physicians who approach

me are likely to stress first one symptom and, if they cannot find that, then switch to another. Therefore, it is difficult for me to assess the relative importance of the symptoms. I can easily xerox my 3 × 5 card by stapling or taping it to a letter-sized sheet.

It was about fifteen years ago that I began keeping records. After ten years I left that particular library for another, and left my records. Probably they have long since been discarded, which does not matter since those syndromes must now be at least cross-referenced in the literature. I began a new file six years ago and, although many of the syndromes have since been included in new editions of the dictionaries, I still find my card file, with the citations, useful. This type of question, in my experience, tends to reoccur maybe two or three years hence, possibly from the same inquirer.

Besides collecting from specific questions, I add to my collection in another way: by scanning our incoming journals daily for unfamiliar-sounding syndromes. (I scan incoming journals anyway for certain subjects and for the publications of our staff.) When I have the time, I investigate at once those syndromes not familiar to me. (Sometimes I find them unfamiliar *only* to me!) In the future I may have requests for these syndromes. If too busy, one loses one's enthusiasm for any extra endeavors, and enthusiasm for all creative matter wanes. Alas, we have been criticized and called technicians, instead of librarians, largely because we often are so busy that we have no enthusiasm for anything not a necessary routine. Recently I encountered five new syndromes in one day in two publications, and eliminated two additional ones as available easily in the literature. If I had not been thinking of this paper, I most certainly would have skipped them that day as theoretical problems, as they are. But, if we know that we may benefit others and that another's effort may benefit us, I think we might look at it differently.

Let me give you two specific examples of recent happenings. About a week ago, I had a request for the Poland syndrome, a recent reference in the pediatric literature. The resident gave me the symptoms of polydactylia and muscle weakness (this is unusually specific). He had been searching only under the name of the syndrome, but I thought he had covered the NLM indexes under the symptoms. We tried *Birth Defects: Abstracts of Selected Articles*. The June 1968 index referred from **Poland syndrome** to **digital anomalies**. We looked up all fourteen references and found nothing. Later I thought to check **muscular anomalies**, and there it was, in a Belgian journal which we do not have. Since we still had not found the article which our staff physician had read in our library about a year and a half ago, the resident went back to check on the date of the article, and I went to my cancelled circulation files, an unprofessional technique, but one which was quickly effective in this case. I found the wanted reference which we have in our library (the original article in *Guy's Hospital Reports* of 1841, we do not have). In our search I noted that the spelling of Poland varies: Poland and Polland. Also, an article was cited by Pol, A. Could this syndrome have been named for a case in the country of Poland originally? My unedited card is as follows:

Poland syndrome (variations: Polland) Also cited as Pol, A. (!) Virchow's Archiv... 229:388 1920

Guy's Hosp. rept. 6:191, 1841
Amer. J. dis. children 110 (1) 85-6 Jy. 1965
Surgery 7: 599- 1940
(in Fr.) Acta paed. Belgica 21 (5) 407- 1967

Recently I happened on a syndrome of some local interest, in a news-type publication. It illustrated a kind that departs from the eponym of the discoverer or reporter of the entity. Two psychiatrists had reported to the American Psychiatric Association meeting their findings and their plan to manage a condition which they designated as the 'Whitman syndrome', named for that people-hunter who injured a number of students and visitors at the University of Texas He was shooting from a vantage spot near the top of the campus Tower Building in Austin in 1966. In view of the fact that the psychiatrists report that they found three cases of this malady on one campus in one semester, we may hear more of this syndrome by the name they designated. It is an apt name and the two psychiatrists names (Kuehn and Burton) would be harder to remember. It appears to be human nature to remember a syndrome by its instigator or investigator, whether he be famous or infamous. In spite of the many well-documented objections in the literature to the naming of syndromes by eponyms, this practice continues and probably will continue. My card on this syndrome is as follows:

Whitman syndrome (Charles Whitman in 1966, U. Tex., shooting from Tower, Austin)

Psychiatric progress 3 (5) Sept-Oct. 1968 p. 2 (Drs. John L. Kuehn and John Burton saw 3 cases on one campus in one semester!) Evolved plan to manage and presented to APA meeting.

I draw the line on keeping records on the tongue-in-cheek-named syndromes, such as the Cinderella syndrome, which I hear was dreamed up for the mystification of a foreign resident by a psychologist. (I believe this was actually published in the psychological literature.) Possibly I am wrong in excluding this type, for the Fat Boy syndrome, named for that character in Dickens' *Pickwick Papers*, was so well named that at one time that was the way requests for it were phrased: Pickwickian syndrome.*

As you have noticed from my examples, the card I now make will need editing by someone who has access to sources I do not have – and time I do not have. Remember these cards have until now been of local interest only, and have been more or less adequate for our needs. In the future I could take more pains for our common cause. Other librarians of small libraries would contribute valuable additions also and would be subject to the same conditions as mine, most probably. Bibliographic peculiarities in our unstandardized citation listing would need to be reconciled. Collecting all our contributions would only be the first stage in making this infor-

* MeSH for 1970 adds the new heading Pickwickian syndrome.

mation available to us all. If this project is worth doing, we shall need a clearing house which is library-oriented and which has ample resources, both physical and financial. This information should be made available at a reasonable price. It should be cumulated for quick and easy use. This finding of a clearing house may not be easy.

My first choice would be the NLM, which might add this title to its recurring publications. This is the Library which selects the subject headings for most of us, and this project might help them in adding to their headings or cross-references. The NLM, in addition to the usual ample physical resources of the larger medical libraries, has machines which presumably would make our project's publication reasonably priced within all our reach. They might find it possible to cross-reference in MeSH, which should simplify and clarify the maze of similar names, multiple spellings, the reversal of name order, and even the addition of another proper name — later — to the syndrome title, presumably with some new symptom discovered. An example of this is the Prader-Willi syndrome, which is later cited as the Prader-Labhart-Willi syndrome. Three cross-references are the minimum number necessitated by the entries in my catalog. It may be that NLM cannot take on additional projects, for they never started a cumulative listing of available translations, a project already suggested to them. Recently, however, a subdivision of their parent organization, the U.S. Public Health Service's National Institute of Mental Health, published a *Bibliography on Psychotomimetics* (1968), an annotated bibliography which 'combines in one volume a number of separate issuances published by Sandoz'.

My next choice of a clearing house would be the MLA which through its international exchange list could spread the word, asking for bibliographic contributions. The problem of editing might make this organization hesitate to become a clearing house. In this time of regional library planning, why could not regional libraries take on duties of this nature for NLM, MLA, or others? The MLA already edits and publishes *Vital Notes on Medical Periodicals*, a very useful list based on items collected and reported by all of us.

If publication is taken over by a commercial firm, the price should be reasonable. Those libraries which most need it should be able to afford it. Possibly some researcher on library problems might approach this syndrome search and retrieval problem in another way. In any case, I hope that I have convinced you that some way, some day soon, someone should 'get on with it'.

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materials for medical biography

L. M. Payne

Although during the past few years there have appeared several lists of individual biographies or autobiographies of medical men (*e.g.*, New York Academy of Medicine, 1960; Thornton, 1961; Schneck, 1955-62), as far as can be discovered the only discussion of sources for medical biography as a whole was that made by Garrison (1928) some 40 years ago. He mentioned more than 300 sources, arranged for the most part on a national basis, and drew attention to the 400 items (some overlapping with his) which are found in the first volume and formed the basis of Hirsch's *Biographisches Lexikon* (1884-88); the revised edition (1932-35) and its supplement by Fischer (1932-33) had not then appeared. It may not, therefore, be untimely to review again what is available, and to ask what is now needed, having regard to the requirements of libraries of different types and size.

My attention was first drawn to Garrison's paper when the number of unsuccessful searches for biographical information in our library seemed far to outweigh the successful ones; and, useful as Garrison was up to a point, it contained no advice to guide one through the mass of material available, nor did it offer more than a very general lead in conducting a search. To my mind this only really becomes clear with an understanding of the organization of the medical profession in the country concerned. If then some account of its organization in England now follows, it is in the hope that the inferences drawn from it in conducting a biographical search may be applied in similar fashion to other countries and may also bring to light what tools may still be needed, or how the gap may be bridged, if at all.

By the beginning of the 16th century it is possible to discern the growth of three regular and many irregular orders of medical practitioners. Willcock (1830), for example, distributes them as follows: first, the scholars – meaning physicians; second, the surgeons; third, the apothecaries, with empirics, alchemists, sorcerers, witches or herbalists among the irregular practitioners, not to mention a species of home medicine which was highly esteemed and constituted the main provision of therapeutic service. This catalogue takes no account of the part hitherto played by the monastic foundations in the care and treatment of the sick. Till now, apart from an abortive attempt to create a college of physicians and surgeons in the 15th century, the profession lacked organization. The first step in this direction in the 16th century was the Act of Parliament (1511/12) which empowered the bishops, in consultation with four physicians, to grant licences to practise. (It was 1948 before this Act was, in fact, removed from the Statute Book.) In 1518 Henry VIII granted a charter to six physicians constituting them the College of Physicians. Chief among them were Thomas Linacre and John Chambre. They were given power to grant licences to practise within London and a radius of seven miles, power which was extended over the whole country by an Act passed four years later. They were also authorized to visit apothecaries' shops to destroy bad drugs. The Barbers and Surgeons, which till then had been independent, were incorporated as a city company, the

Surgeons, in 1540. This somewhat uneasy alliance lasted for 200 years, but the Company of Surgeons formed in 1745 had a shorter existence and was succeeded by the Royal College of Surgeons in 1800. It should not be forgotten that one result of the scientific renaissance of the 17th century was the foundation of the Royal Society in 1660, that many physicians were numbered among its first fellows, and that that link with the profession still exists. Meanwhile, the apothecaries, who were separated from the grocers and became the Worshipful Society of Apothecaries in 1617, increasingly arrogated to themselves more than the right to dispense medicines. This involved them in intermittent disputes with the College of Physicians. An important lawsuit, decided in their favour, secured them tacit recognition as general practitioners (1702-03); they were not, however, given authority to grant licences until 1815. Meanwhile, the pattern of medical education had remained largely unaltered for 300 years. That some reform in the system of medical education and registration was necessary became evident in the early part of the 19th century, but it was not until the passing of the Medical Act of 1858 that a system of registration embracing all the many methods of entry into the profession, including both the universities and Royal Colleges, was set up.

What is the significance of this brief résumé of the organization of the profession when considered in relation to medical biography? Since 1859, when the *Medical Register* was first published, there has been an annual record, authoritative and complete, containing the names of all physicians and surgeons properly qualified and legally entitled to practise; but it gives no more than name, address, the registrable qualification, and date of registration. The *Medical Directory*, which is not necessarily complete, as inclusion depends on the regularity with which the members of the profession provide information and revise it, contains details of their education and appointments, and some account of their writings. More valuable still is the fact that up to and including 1914 each annual volume records notices of the deaths reported during the past twelve months and some obituaries. Since this work has now been published without a break since 1845, it is comparatively easy to identify members of the profession who have flourished during the past century and more. Its early volumes embraced London, and then the provinces (1847), and were gradually extended to cover Scotland (1861) and Ireland (1861), and eventually included sections to cover the armed forces (1864) and those resident abroad (1861). Before this, there is really no comprehensive source; the tools we have reflect the development of the profession.

The mediaeval period, from Anglo-Saxon times into the 16th century, is covered by Talbot and Hammond's register (1965), which overlaps with Munk's *Roll* (1878). The entries, some 1,300 of them, are naturally made under the forename, but this can be confusing where the record overlaps with Munk's *Roll* and names like Thomas Linacre and John Chambre appear under 'T' and 'J', although this is taken care of in the index. William Munk, Harveian Librarian of the Royal College of Physicians for about the last 40 years of the 19th century, set out to provide biographical notices of all Fellows and Licentiates of the College from its foundation in 1518 to 1825; this he achieved in the first three volumes of his *Roll*, known to many but not, apparently, to Garrison. The year 1825 referred to the date of admission as Fellow or

Licentiate. The passing of the Medical Act (1858) made way for a new order, Membership of the College, and this so increased the numbers to be included in the *Roll* that the last two volumes are limited to Fellows. But the Licentiates elected between 1825 and 1858 are covered in a typescript work of three volumes in the College. The terminal date (1965) of the fifth volume, which has just been published in celebration of the College's 450th anniversary, refers to date of death rather than date of admission. Although the College has published an annual *List* (or *Catalogue*) of its Fellows, etc., since the end of the 17th century, that *List* is only of value for admissions of Licentiates, particularly during the years 1826 to 1858, and some details of places of residence.

Before 1845 there are no directories, if one excepts the *Medical Register* (1779-83), an unofficial work compiled by Samuel Foart Simmons, and the lists, covering London only, which appeared in certain numbers of Houghton's *Collection for Improvement of Husbandry and Trade* (1694-95). Now the first three volumes of Munk include no more than 1,723 names for a period of just over 300 years.* The Annals of the College (unpublished) contain records of proceedings against empirics and doctors practising without a licence, but this record is very sketchy. Moreover, although in theory it had authority over the whole country, the College found itself unable to implement it. In consequence, provincial physicians without a university degree derived their authority to practise from licences granted by the bishops. They still exercised that authority in spite of the College and the impression, that might have gained ground, that their Charter of 1518 made superfluous the Act of 1511/12 and indeed superseded it. But there are virtually no printed records for such licences, and search must be made in diocesan records in local authority or ecclesiastical record offices. True, J. H. Bloom and R. R. James (1935) published an annotated list covering 1529 to 1725, but that was for the diocese of London, and J. H. Raach (1962) has produced *A Directory of English country physicians, 1603-43.* Some apothecaries are found in the records in the Royal College of Physicians of visitations of apothecaries' shops, but the only printed list for apothecaries is that covering licences granted between 1815 and 1840 by the Society of Apothecaries (1840). The manuscript records of that Society are now deposited in the Guildhall Library in the city of London, together with those of the Barber-Surgeons Company.

The equivalent of Munk for surgeons, Plarr's *Lives* (1930), covers little more than a century, since the Fellowship of the Royal College of Surgeons was not instituted until 1843. Their lists of members, etc., date from the beginning of the 19th century. Outside this period are the army and navy surgeons, never easy to trace. The *Roll* by Johnston (1917) and the *List* of Peterkin (1925) have, however, recently been reprinted in a two-volume work by Drew (1968), which brings the record of commissioned officers in the medical services of the British army up to date and covers 300 years from 1660 to 1960, while D. G. Crawford (1930) does something similar for the Indian Medical Service, 1615-1930. For the naval medical service there is virtually nothing, save what is given in the first *Medical Register* and guidance on manuscript sources, to be found in Keevil *et al.* (1957-63) *Medicine and the Navy.*

*The *Medical Register* of 1783 has nearly 4,500 names, and that for 1859 shows that over were registered under the Act of 1858.

Anyone regularly handling biographical material quickly becomes conscious of a certain pattern. The tools are either international or national in scope, or are limited to a special subject field. Further, they are usually limited to the living or dead. The registers of alumni of universities may be considered to occupy an intermediate place between special medical and national biographical tools. Recent volumes for Oxford (Emden, 1957-59) and Cambridge (Emden, 1963) take their record back to mediaeval times. Not all lists of graduates are as informative as these. A list originally published in the *Bulletin of the Institute of Historical Research* (Raven-Hart and Johnston, 1931-33) gives a guide to what has been printed for Great Britain and Ireland. R. W. Innes Smith's (1932) *English-Speaking Students of Medicine at the University of Leyden* is particularly useful, and the notebooks which have been deposited in the College show that he had transcribed similar information from the records of many continental universities. Here is a fruitful field of research.

Reference was made earlier to the connection of the Royal Society (of London) with the medical profession. Their annual volumes of *Biographical Memoirs* are essays in the biography of deceased Fellows and are much fuller than anything mentioned so far, and contain a full bibliography of their writings. Before this series commenced in 1932, less detailed obituary notices appeared in the *Proceedings* or, after 1900, in the *Yearbook* of the Society; volume 75 of the former contains obituaries chiefly for the period 1898 to 1904, with an index to obituaries in the *Proceedings*, 1880-99. The *Dictionary of National Biography*, which covers the earliest historical period with supplements down to 1940, not only includes many physicians in Munk's *Roll*, but others who were not of the College, and also many surgeons. What is not covered by the *DNB* is covered in less depth by Boase's *Modern English Biography* (1892-1921) for the period 1850 to the end of the century. Then, for the earlier and more difficult period, there is Musgrave's *Obituary* (1899-1901), which is and index of obituary notices in the *Gentleman's Magazine* and elsewhere.

The biographical apparatus for the medical profession of one country has now been described in some detail. The medical librarian is fortunate if he knows those sources for his own country and is unlikely to be aware of similar sources for other countries. How then may this treatment be applied to the sources for other countries or periods? For this purpose, Garrison's national lists need to be brought up to date and examined to see how far they can be divided into national dictionaries, directories, sources for special classes or groups of the profession, how far the national universities are covered by lists of alumni, and to take account of the further advice Garrison gives in relation to the part played by bibliographies and histories. For example, two published portrait catalogues (New York Academy of Medicine, 1960-65; Royal College of Physicians, 1964), indexing portraits of medical men in books, are at the same time valuable keys to biographical details given in histories and other works. In addition, the history of the profession should be considered for the light that it might throw on the availability and whereabouts of unpublished sources.

Now what of Garrison's 'a few available war-horses', for it is these last that provide the essential tools for today, and the starting point for our final task of asking what is needed, and what is practicable. Of the seven specified by Garrison, it is surely desirable to have Eloy (1778), Jourdan (1820-25), Callisen (1830-45), and Hirsch

(1884-88; 2nd ed. reprinted 1962) and if the choice were limited to one, then the last named. This at least with Callisen has been reprinted. But since, basically, it is nearly a hundred years old, do we need a new Hirsch, or more practically, can we afford it? Is an entirely new work needed or are existing tools sufficient? Fischer, which has also been reprinted, brings Hirsch down to 1930. Libraries which do not have, for example, *Quarterly Cumulative Index Medicus*, *Biography Index*, or other similar tools like *Current Work in the History of Medicine* (1954-) or *Bibliography of the History of Medicine* (1965-), although their value is not primarily for or limited to 20th century subjects, may well need a further supplement to bring Hirsch right up to date. There has been some talk of an extensive revision of the *DNB*, but this has been rejected on account of its cost, although consideration is being given to a new dictionary based on special periods. The late W. J. Bishop had collected material for a dictionary of British medical biography, and this project has not, I think, been abandoned. That much material exists in journals is evident from what can be found through the *Quarterly Cumulative Index Medicus* and the four series of the *Index-Catalogue* of the Surgeon-General's Office. It is unfortunate that obituaries are no longer indexed in *Index Medicus*, but MEDLARS searches for 1963-7 have retrieved nearly 10,000 references to biographical material which, with the dates often in the heading, constitute of themselves a dictionary of medical biography (or perhaps biographical reference would be a better term). One of the most useful biographical desk tools I know is the second edition of Hyamson's *Dictionary of Universal Biography* (1951); the entries are confined virtually to a single line, giving dates, nationality, field of interest, with symbols indicating a few sources of further information. If a new work were contemplated, would it be possible for it to use Hyamson as a model? A resourceful librarian with a sound knowledge of the tools at his command and a good basic training in reference work can usually identify and find a few details of important figures without too much difficulty. It is the lesser known figures with which the librarian needs help; it is doubtful whether any single tool will help here, unless it be a guide to the national resources available Such a series of guides, perhaps on the pattern of the meat of this paper, would be a less costly and, in many ways, a more rewarding task.

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Anyone regularly handling biographical material quickly becomes conscious of a certain pattern. The tools are either international or national in scope, or are limited to a special subject field. Further, they are usually limited to the living or dead. The registers of alumni of universities may be considered to occupy an intermediate place between special medical and national biographical tools. Recent volumes for Oxford (Emden, 1957-59) and Cambridge (Emden, 1963) take their record back to mediaeval times. Not all lists of graduates are as informative as these. A list originally published in the *Bulletin of the Institute of Historical Research* (Raven-Hart and Johnston, 1931-33) gives a guide to what has been printed for Great Britain and Ireland. R. W. Innes Smith's (1932) *English-Speaking Students of Medicine at the University of Leyden* is particularly useful, and the notebooks which have been deposited in the College show that he had transcribed similar information from the records of many continental universities. Here is a fruitful field of research.

Reference was made earlier to the connection of the Royal Society (of London) with the medical profession. Their annual volumes of *Biographical Memoirs* are essays in the biography of deceased Fellows and are much fuller than anything mentioned so far, and contain a full bibliography of their writings. Before this series commenced in 1932, less detailed obituary notices appeared in the *Proceedings* or, after 1900, in the *Yearbook* of the Society; volume 75 of the former contains obituaries chiefly for the period 1898 to 1904, with an index to obituaries in the *Proceedings*, 1880-99. The *Dictionary of National Biography*, which covers the earliest historical period with supplements down to 1940, not only includes many physicians in Munk's *Roll*, but others who were not of the College, and also many surgeons. What is not covered by the *DNB* is covered in less depth by Boase's *Modern English Biography* (1892-1921) for the period 1850 to the end of the century. Then, for the earlier and more difficult period, there is Musgrave's *Obituary* (1899-1901), which is and index of obituary notices in the *Gentleman's Magazine* and elsewhere.

The biographical apparatus for the medical profession of one country has now been described in some detail. The medical librarian is fortunate if he knows those sources for his own country and is unlikely to be aware of similar sources for other countries. How then may this treatment be applied to the sources for other countries or periods? For this purpose, Garrison's national lists need to be brought up to date and examined to see how far they can be divided into national dictionaries, directories, sources for special classes or groups of the profession, how far the national universities are covered by lists of alumni, and to take account of the further advice Garrison gives in relation to the part played by bibliographies and histories. For example, two published portrait catalogues (New York Academy of Medicine, 1960-65; Royal College of Physicians, 1964), indexing portraits of medical men in books, are at the same time valuable keys to biographical details given in histories and other works. In addition, the history of the profession should be considered for the light that it might throw on the availability and whereabouts of unpublished sources.

Now what of Garrison's 'a few available war-horses', for it is these last that provide the essential tools for today, and the starting point for our final task of asking what is needed, and what is practicable. Of the seven specified by Garrison, it is surely desirable to have Eloy (1778), Jourdan (1820-25), Callisen (1830-45), and Hirsch

(1884-88; 2nd ed. reprinted 1962) and if the choice were limited to one, then the last named. This at least with Callisen has been reprinted. But since, basically, it is nearly a hundred years old, do we need a new Hirsch, or more practically, can we afford it? Is an entirely new work needed or are existing tools sufficient? Fischer, which has also been reprinted, brings Hirsch down to 1930 Libraries which do not have, for example, *Quarterly Cumulative Index Medicus*, *Biography Index*, or other similar tools like *Current Work in the History of Medicine* (1954-) or *Bibliography of the History of Medicine* (1965-), although their value is not primarily for or limited to 20th century subjects, may well need a further supplement to bring Hirsch right up to date. There has been some talk of an extensive revision of the *DNB*, but this has been rejected on account of its cost, although consideration is being given to a new dictionary based on special periods. The late W. J. Bishop had collected material for a dictionary of British medical biography, and this project has not, I think, been abandoned. That much material exists in journals is evident from what can be found through the *Quarterly Cumulative Index Medicus* and the four series of the *Index-Catalogue* of the Surgeon-General's Office. It is unfortunate that obituaries are no longer indexed in *Index Medicus*, but MEDLARS searches for 1963-7 have retrieved nearly 10,000 references to biographical material which, with the dates often in the heading, constitute of themselves a dictionary of medical biography (or perhaps biographical reference would be a better term). One of the most useful biographical desk tools I know is the second edition of Hyamson's *Dictionary of Universal Biography* (1951); the entries are confined virtually to a single line, giving dates, nationality, field of interest, with symbols indicating a few sources of further information. If a new work were contemplated, would it be possible for it to use Hyamson as a model? A resourceful librarian with a sound knowledge of the tools at his command and a good basic training in reference work can usually identify and find a few details of important figures without too much difficulty. It is the lesser known figures with which the librarian needs help; it is doubtful whether any single tool will help here, unless it be a guide to the national resources available. Such a series of guides, perhaps on the pattern of the meat of this paper, would be a less costly and, in many ways, a more rewarding task.

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5

education and manpower

the information needs of the medical profession and future staff requirements of medical libraries: implications for the education and training of medical librarians

G. R. Pendrill

'Medical science — who is there among us who can give these two words a concise definition? They are words with the broadest of connotations. They encompass the entire spectrum of the natural and the physical sciences as those sciences relate to health. There are even those who would include the rapidly-developing fields of social science within the meaning of the term medical science. To speak of medical science as an entity is to be imprecise, unspecific, and unfair. No such thing as medical science exists as an entity. The term is an embracing one, umbrella-like in its meaning. There is, indeed no special field of science unique to medicine. Medicine . . . emerges from a multitude of science and is indebted to them all.'

W. C Wescoe
J. Amer. med. Ass., 189, 203, 1964.

If we look at a medical book published, say, 500 years ago we are immediately struck by the differences in style and content from books of the present time*. It is possible, too, to discern changes of a similar nature occurring down the centuries. You will notice how the books of one period differ not only from those of the present time, but also from those of the periods immediately adjacent to them. As we approach the 20th century we can slow this process down and look at literature separated by shorter intervals. There is a constant process of evolution in the medical literature. Furthermore, this process is tending to accelerate as we come nearer to the present day. In fact, if we think only of the last few years, we have witnessed such notable advances as the synthesis of penicillin and insulin, the decipherment of the protein molecule, transplantation of the heart and other vital organs, and, only a few weeks ago, the creation of human life *in vitro*.

One reason for the acceleration of change in recent years has been identified in an article appropriately titled 'The unity of science-technology' (Kranzberg, 1967). The author draws attention to the continued reduction in the time between the discovery of a principle and its application (Fig. 1), giving such examples as the steam engine (which took 1,700 years), the electric motor (40 years), nuclear power (5 years), and lasers (18 months) His explanation is that:

> *the association of science, which wants to know 'why?', and technology, which wants to know 'how?' brings about chain reactions of scientific discovery and technological invention. This interaction may one day light up, explode, and fuse certain areas in a sudden chain reaction of small advance upon small advance, bursting toward break-through.*

* During these introductory remarks a number of slides were shown illustrating changes in the style and content of medical books from 1493 to the present day. A list of the items shown can be obtained from the author.

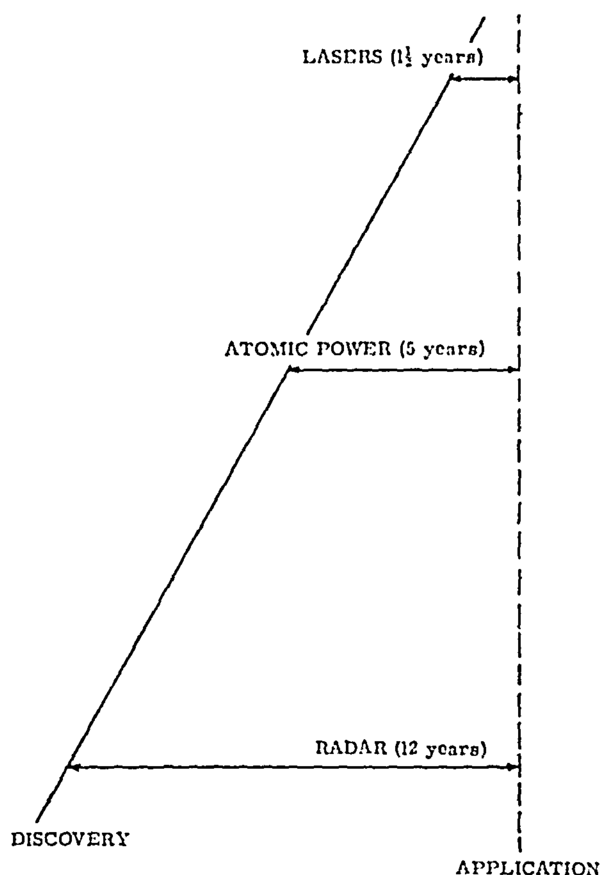


Fig. 1. Time lag between discovery and application.

I think it can hardly be disputed that many of the interesting and exciting things happening in medicine today have been made possible by *technological* progress. (Perhaps Melvil Dewey was nearer the truth than he realized when he classified medicine as one of the technologies!)

What is the source of this progress? In many cases, a closer look at what is involved will reveal a common thread which runs through them all: that these advances have been made possible either by developments at the fringe of medicine itself, or by developments in strictly *non-medical* fields such as engineering, electron microscopy, X-ray crystallography, computer science, and so on. A very down-to-earth example is the recent replacement of the traditional dental drill by the high-speed, air-driven, water-cooled drill: this is a direct instance of a problem in dentistry being tackled, and solved, as a problem in engineering.

Recently I visited the Biological Sciences Communication Project in Washington. One of the many activities of this project has been the formation and maintenance of several teams of scientists whose object is to discover, in the enormous mass of literature originating in the American space programme, scientific and technological innovations which could usefully be employed for medical purposes. An elementary instance was a requirement to remotely monitor the heart beats of a child cardiac patient, without interfering with his normal activities at school and at play. The solution was found in examining how the same problem had been approached in

monitoring the vital functions of astronauts. Again, the approach to the problem, and the solution, were technological rather than medical.

However, technology alone is not the only source of progress. Interactions are also occurring more and more frequently at the interfaces between different branches of science itself. Toulmin (1967) refers to 'a kind of hybridization which sometimes takes place . . . giving rise to brand-new specialties, with subsequent genealogies and histories of their own'. A striking example, he says, was 'the emergence of molecular biology . . . through the cross-fertilization of crystallography and biochemistry'.

Some years ago the Director of the National Science Foundation (Waterman, 1961) also commented on this trend:

> *It is, of course, impossible to predict discoveries that may lie ahead in science, but the knowledge that we have acquired in recent years, coupled with a whole array of spectacular new instrumentation, insures that important breakthroughs will occur in a number of significant fields. Starting with the macrocosm and working our way through the gross phenomena of our universe and our environment to the subatomic world of nuclei and particles, we see that we are acquiring new knowledge at an ever-accelerating pace. New tools and techniques are giving us new insights and the old hard and fast classifications of knowledge into separate disciplines are gradually giving way as piece after piece falls into place in what seems to be the grand symmetry of nature . . . . In the life sciences, we find that we are able to analyze the problems in a way that would not have been possible a generation ago. Such techniques as chromatography and the use of the ultra-centrifuge, electron microscope, and so on, have made it possible to apply, to living matter, more quantitative measurement. At the point where men acquired the ability to isolate and manipulate the giant molecules, whole new worlds of biological research were opened up and molecular biology came into being. The chemists, physicists, and even the mathematicians began to find problems in the life sciences interesting, and the application of techniques from these disciplines has revealed new avenues of exploration. We are learning a great deal about such basic questions as how life is formed, how energy is used and stored, and how an organism duplicates itself . . . . Fundamental knowledge of this type brings us much closer to the control of certain diseases. . . . The whole history of science demonstrates that the solution of a perplexing problem quite often comes from a totally unexpected source; and oftener still, a discovery in one field turns out to have far greater significance in another, just as Roentgen's discovery has so profoundly influenced the course of modern medicine.*

The effect on medicine may be demonstrated by looking at some of the topics discussed in the *Medical Annual* at different periods. In the 1968 volume we find:

- Foetal blood sampling
- Microsurgery of the eardrum
- Tissue typing for renal transplantation
- Fatty acids in teeth
- Hyperbaric oxygen
- The use of a photon beam to measure osteoporosis

The various uses of computers, lasers, neutrons and pi-mesons
Social questions such as food habits among Asian and West Indian immigrants in the British Isles.

In the same publication 10 years earlier, we find:

Nuclear sexing
Psychopharmacology
Chemical additives in food
The chemical structure of vitamin B_{12}
The biological effects of gibberellic acid
Fluoridation
Open surgery of the heart (which was termed 'a milestone').

The last item alone will show how far we have come in those 10 years, when complete replacement of the heart has now become almost a commonplace. Contrast these topics with those of 10 years earlier still, when the chief items of novelty were the chemotherapy of tuberculosis with streptomycin and PAS, radioisotopes, radiation hazards, and the new study called 'social medicine'. Yet another 10 years in the past, the volume was concerned almost exclusively with clinical matters, and the topic of chief importance was the introduction of the new wonder drugs, the sulfonamides.

Some of the current trends in medical research can be discerned in guides to research in progress. A recent volume dealing with Britain (*Scientific Research in British Universities and Colleges, 1968*) includes the following under the general heading 'Medicine':

Studies in intracardiac electrocardiography
Design and efficiency of dialysers
Total body-heat measurement
Patient-monitoring systems
Biplane cine-angiography with image intensification
The chemical nature of lung surfactants
Computerised analysis of ulcerative colitis
The effectiveness of medical television programmes
Planning medical care for a new community
Whole-body neutron activation
Studies in the aerospora of woodlands
Bio-engineering studies on joint stiffness and lubrication
Applications of ultrasonic and electronic techniques to the study of renal blood flow.

Let me emphasize again that these are drawn from the general heading 'Medicine' and not from one of the biomedical specialties. The last two topics led me to examine the sort of literature that was associated with bio-engineering and ultrasonics. From an inspection of the bibliographies of two books on these topics (Kenedi, 1965; Gordon, 1962), I compiled a list of some of the non-medical items used by the authors as source material (Tables I and II).

Table I. *Biomechanics and related engineering problems. Periodicals cited.*

Aerospace Telemetry
Applied Mechanics Reviews
American Engineer
Argonne National Laboratory Reports
British Communications and Electronics
Engineering Materials and Design
Institute of Radio Engineers Convention Record
International Commerce
Journal: Acoustical Society of America
Journal of Fluid Mechanics
Journal: Institute of Production Engineers
Materials Evaluation
Mechanical Engineering
Metalworking Production
Nachrichtentechnik
Proceedings. Society for Experimental Stress Analysis
Royal Aeronautical Establishment Technical Memorandum
Solid State Electronics
Transactions: American Society of Mechanical Engineers
Ultrasonics
U.S. Patents
Wireless World

Table II. *Ultrasound as a diagnostic and surgical tool. Periodicals cited.*

Acustica
Audio Engineering
Bulletin of Mathematical Biophysics
C.R. Acad. Sci. U.R.S.S.
Electronics
Engineer (London)
General Semantics Bulletin
Industrial Electronics
Industrial and Engineering Chemistry
Institute of Radio Engineers Convention Record
Journal: Acoustical Society of America
Philosophical Magazine
Proceedings: Institute of Radio Engineers
Review of Scientific Instruments
Verhandlungen: Deutsche Physikalische Gesellschaft

Although it might be objected that it is unfair to select these two highly technological subjects as my illustrations (and I will accept that this criticism may have some justification), I have taken the extreme case to show the trend of events. My point is that this is the sort of area where the medical information worker of the future may find himself operating.

Some years ago, the NLL in Britain made a survey of the bibliographic sources from which workers in different fields of activity drew the references to the items they requested from the Library. Figures for 'Medicine' were not available separately from 'Biology', but under the latter heading the ranked listing was as follows (Table III).

Table III. *NLL survey (May 1963). Bibliographic guides to biomedical literature cited most often by readers trained in this field.*

1. Biological Abstracts
2. Chemical Abstracts
3. Review of Applied Mycology
4. Zoological Record
5. Current Contents
6. Bibliography of Agriculture
7. Index Medicus
   Current Chemical Papers
8. U.S. Government Research Reports
   Veterinary Bulletin

Table IV. *NLL survey (May 1963). Bibliographic guides to biomedical literature cited most often by all readers.*

1. Chemical Abstracts
2. Biological Abstracts
3. Current Contents
4. Index Medicus
5. Review of Applied Mycology
6. Zoological Record
7. Current Chemical Papers
8. U.S. Government Research Reports
9. Veterinary Bulletin
10. Bibliography of Agriculture

It is interesting that this order is that provided by workers trained in the biological sciences. Notice that *Index Medicus* comes at seventh position on the list. On the other hand, when all requests relating to biology were grouped together irrespective of the subject specialty of the worker making the request (Table IV), the position of *Index Medicus* improved to fourth place, and the first place was taken by *Chemical Abstracts*. As a compendium of information on nearly all topics in the sciences, the latter occupied one of the first four places in all subjects, and this will come as no surprise to you. But it is perhaps significant that it occupies first position as a source for biological information as well as for chemistry.

Another interesting indication of the relative importance of the various aspects of medicine may be derived from the work of Raisig (1966) at the Yale Medical Library. In an attempt to establish an objective measure of the 'significance' of journals 'as vehicles for the communication and dissemination of ideas related to medicine', he studied 21,000 citations randomly sampled from journals published during 1961 and 1962. He then ranked the titles of the cited journals according to an 'index of significance' which expresses the ratio of the number of articles cited to the number of articles published. Each journal was also categorized by one of 37 subject categories based on a subject listing of the journals covered by *Index Medicus* (Brandon, 1962). Raisig lists the first 200 titles, ranked in order of their 'index of significance'. I found that in 18 of the subject categories — that is to say, in almost 50% of the subjects — 5 or more titles were listed, and I added together the index figure for the first 5 titles in each subject.

In the resulting table (Table V) can be seen the relative distribution of subjects belonging to the clinical and the non-clinical areas. If we consider general medicine, gynaecology, cardiology, paediatrics, cardiology, surgery, and psychiatry to be clinical subjects, this means that the remaining two-thirds of the list covers subjects of a non-clinical nature. It should be remembered that the index of significance is a measure of the use of a periodical. It seems to me that it would be legitimate to consider it also as an indicator of the amount of activity in a particular area.

Needless to say, this trend in medicine has not gone unremarked, and, in fact, many writers have been at pains to emphasize the unity of medicine with the physical sciences, technology, and the social sciences. Here are three such comments:

Table V. *Gross significance index.*

Clinical subjects	Rank	Non-clinical subjects
	1	Experimental medicine
	2	Physiology
General medicine	3	—
	4	Ophthalmology
	5	Anatomy
	6	Pharmacology
	7	Neurology
Gynaecology	8	—
	9	Biochemistry
	10	Haematology
Cardiology	11	—
	12	Pathology
Surgery	13	—
	14	Microscopy
	15	Radiology
	16	Endocrinology
Psychiatry	17	—
Paediatrics	18	—

There is a great need . . . in medical education and research for M.D.s with scientific training in depth . . . . Such a person . . . is often in a particularly advantageous position to couple scientific advance to clinical medicine. I see a particular need in medicine for physicians who have profound knowledge of the hard sciences: mathematics, physics, and chemistry (Bennett, 1964).

Another writer says,

. . . we think of the anatomist, the mammalian physiologist, the biochemist, the pharmacologist, and the microbiologist, for with them we rub shoulders almost day by day. But only a trifle more remote are the botanist, the plant physiologist, the soil chemist, the physicist, the plastics engineer, the pharmaceutical chemist, and the electrical engineer. These, and others like them, have become a part of modern medicine; [it] would not, and can not, exist without them (Wescoe, 1964).

And another says,

The physician . . . must collaborate with social scientists, economists, community planners, anthropologists, social psychologists, engineers and a host of other disci-

plines to provide for society the entire range of... preventive and therapeutic measures (Coggeshall, 1965).

These trends also have significant implications for the future training of doctors, and it is not to be expected that these have escaped the notice of those responsible. A good deal of discussion has taken place among medical educators about the changing emphasis on the basic sciences in medicine:

The second great force changing the face of medical education has been the infusion of new scientific knowledge into the curriculum. It is hard to grasp the finality with which basic medical sciences moved from the gross descriptive biology of Flexner's time to today's dynamic fields, thrusting ever more deeply into the complex mysteries of life. The microscope has become an electron microscope, histology evolves into cytology, a secreting organ is a membrane with electro-chemical properties, and the laws of Mendel are transformed into a code based on a helix. The excitement generated by molecular biology and electro-physiology, by open-heart surgery, and by computers has produced a dissatisfaction with our present program of medical education. The sheer mass of new concepts and facts and the application of sophisticated physics and chemistry to the life sciences have made us doubt that the traditional curriculum is adequate.... As a result of the great advances in basic biology in the past few decades, there is an increasing tendency towards including more fundamental science in the professional school... for example... quantitative biology, bacterial genetics, physical biochemistry, biomathematics.... If these plans are vigorously pursued... the very nature of the medical student will have to change. The premedical major from a liberal arts college will be less qualified for these programs than the physics major from an engineering college (Jacobson, 1967).

One can gain some impression of the effects of these changes in the medical curriculum by comparing the departments and staffing of a medical school before the War with the position at the present time. In 1938 a certain medical school in North America had 19 departments and 32 staff with the rank of Associate Professor or Professor, and a little over 200 students. Thirty years later, the same school, with around 300 students, had over 100 teaching and research staff at the top levels, while the increase in research students and supporting staff was prodigious. The number of departments had increased to 28, by a process of fusion, fission, and multiplication. It is not difficult to agree with the statement that:

Closely related to advances in medicine has been the development of specialization.... The... more complex a subject becomes, the more need there is for specialization - certainly in research, and to a lesser degree in practice. Even the basic sciences which relate to medicine have become more specialized, and it is rare to find the anatomist equally well informed in gross anatomy, histology, including histochemistry, and fine structure. Nor are there many biochemists who are equally expert in intermediary metabolism, nucleic acid metabolism, and protein chemistry. (Ebert, 1967).

All these various workers must have their own special needs for information, and many of them require information drawn from fields other than medicine. I have

already given a hint of the possible effects of this trend on medical information work in the examples mentioned. This was recognized by one of the speakers (Strother, 1968) at a conference on medical library education held in Seattle towards the end of 1967, when he said:

The principal implication for medical librarianship of the trend toward comprehensive medicine is that the librarian must be familiar with a much broader range of literature than has traditionally been included in the medical library. . . . Training programs must prepare for a diversity of functions.

There is an echo here of the comment made by another doctor (Brill, 1965) writing to arouse support among his colleagues for the Medical Library Assistance Act during its passage through Congress:

Three situations have contributed materially to the need for research and development in health-science librarianship and related activities. First, sheer quantity has put the medical literature beyond effective management without the assistance of advanced mechanized processes. Second, the complexity of the literature, reflecting the increasingly multidisciplinary character of medicine, likewise demands new library concepts and procedures for meeting the needs of medical scientists, teachers, and practitioners. Third, the breakthroughs in the processes of storing and retrieving scientific data provide an opportunity to exploit these advances.

The speakers at the Seattle conference included several of the leading members of our profession in the U.S.A. It is an encouraging sign that some of them have since been awarded grants from the Public Health Service to investigate some of the problem areas they discussed. However, after reading through the proceedings I was left with a distinct impression that in one respect the speakers tended to put the cart before the horse. Before we can talk in real terms about the education of medical librarians we must ask ourselves 'What are we educating them for?', and before we can answer that question we must know what their clientele requires of them.

In other words, it seems to me that a pre-requisite to any valid discussion of education for medical librarianship is the study and identification of the information needs of the medical community we serve. It is true that this point did occur in the discussion of a paper by Dr. Richard Orr of the Institute for Advancement of Medical Communication, but what surprises me is the apparent lack of emphasis it received. All that was said was that 'more knowledge of the functions of the health sciences community would enable librarians to specify what kinds of information and services ought to be provided. Functional analysis of the environment is essential to the planning of an educational program' (Orr, 1968). The paper which was being discussed and the earlier work to which it referred (U.S. National Academy of Sciences, 1964) were concerned with a functional analysis of the communications problem in terms of a system. The following paper (Esterquest, 1968) was concerned with new audio-visual techniques and computer-assisted learning. These two trends of thought may be said to culminate in the university health sciences information centre proposed by the Vice-President of EDUCOM, the Inter-University Communications Council (Miller, 1967).

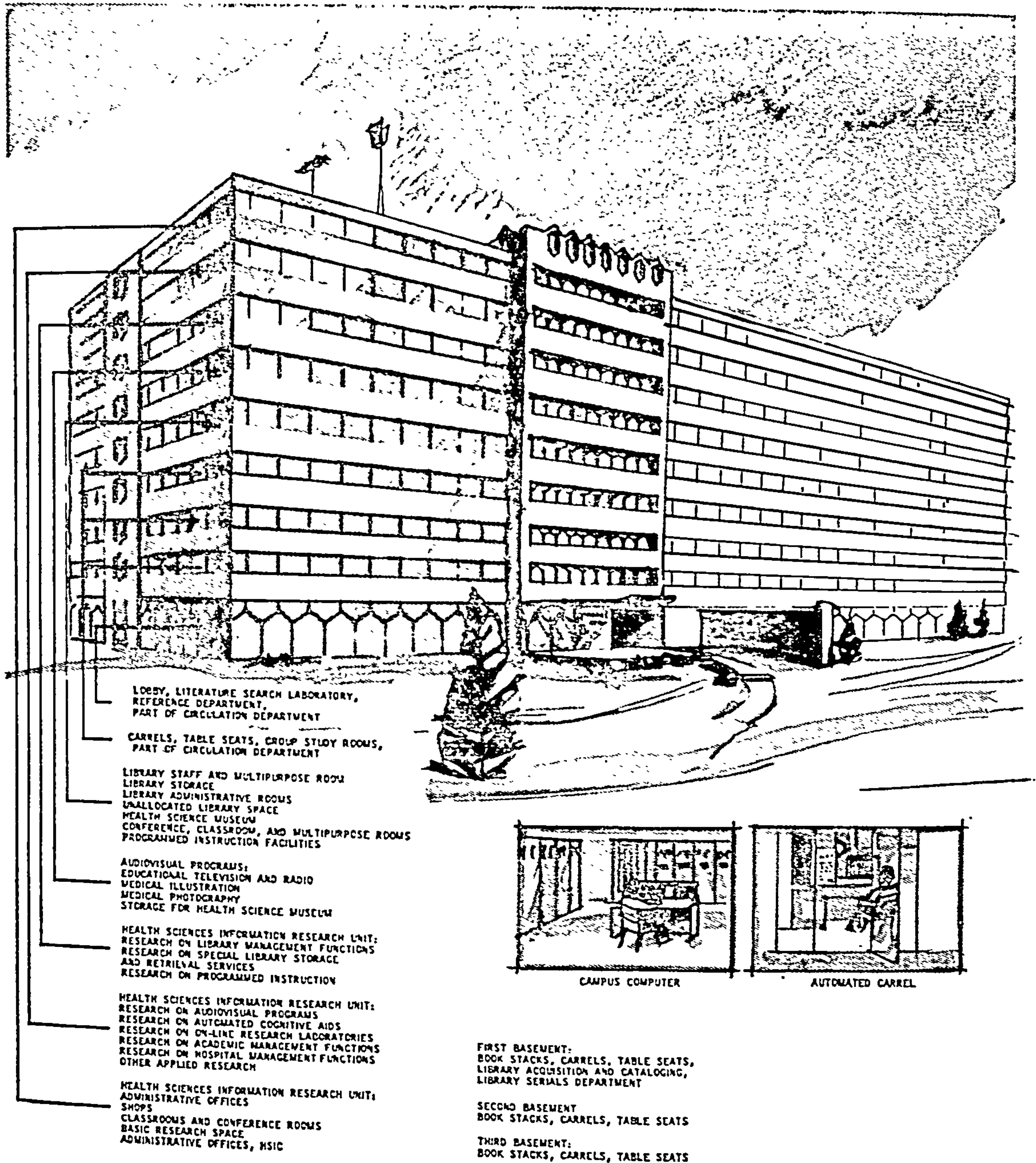


Fig. 2. One possible design for a health sciences information centre. Reprinted with permission from the *Journal of Medical Education*, 42, 423, 1967.

In the building shown in Fig. 2 are combined not merely what one might call a medical library *plus*, including a very sophisticated information and data retrieval centre, but also facilities for audio-visual and programmed instruction, educational radio and television, a museum, and research units conducting basic and applied research into all of the above and also into hospital and academic management. A special feature is the provision of automated carrels containing an on-line terminal with cathode ray display and a light pen, audio and visual facilities, a microscope, and so on.

At Cleveland State University a 21-million-dollar tower block is nearing completion. The lower 12 of the 21 floors have been allocated to an information centre of the type described, and the tower is connected through tunnels to all the other buildings on the campus (*Personal communication* from Dr. *Miller*, Feb. *12, 1970*).

I am not one of those who regard the computer as the answer to all our problems, but it seems to me that in a few years this proposal will not seem so improbable as it does at present.

However, to return to the comment I wanted to make on the Seattle conference. This was to ask whether we are satisfied that we know what it is that our clients want to know. Very few studies have been made of this qualitative aspect of the problem (although the fact that such organizations have been founded as the Institute for Advancement of Medical Communication, and the Biological Sciences Communication Project, is evidence of the interest of the biomedical community in the *how of their problem*). *I should like to see a very thorough investigation made into the nature* of the information requirements of the biomedical worker, because it seems to me that this should precede the formulation of any educational programme for information workers in this field. Dr. Alan Rees (1966) has said:

The assessment of user needs must . . . be made in relation to the behavior and experiences of scientists . . .. Librarianship and information science would be substantially advanced if we were to approach the information problem via the user and his needs [which] are far too complex to be satisfied by documents or document representations alone.

I am convinced that the trends to which I have drawn attention are of such a nature as to demand from us a very thorough re-appraisal of ourselves and of our work. To quote again from the Seattle conference:

There will undoubtedly be an important role for someone to serve as an 'interface' between the research worker and the system. This will, of course, require some familiarity with the particular area of research and thus create positions for librarians (or information specialists) who have had substantial background in various behavioral and social science fields as well as for those with a background in physical or biological sciences (Strother, 1968).

Has the education and training of most of us present today been along lines which would give us adequate, or appropriate, preparation to meet this situation? My own inquiries suggest that medical librarians are no exception to the general preponderance of Arts graduates in librarianship.

We have barely scratched the surface of the immense mass of science-trained people who emerge from our universities. It seems that the thought of taking [illegible] career in librarianship or information work does not readily enter their minds. [illegible] medical librarianship, in particular, could offer much that might engage the [illegible] of the kind of person who does move from science into information work. [illegible] my own somewhat limited experience of interviewing science [illegible] library school places, I have learned that their motivation for [illegible] work is nearly always the same. *They would prefer to work in a* [illegible]

people rather than with apparatus in a laboratory. At the same time, they are still very anxious to make some positive contribution to the work of the scientific community. (There is nothing reprehensible in this: not every person with scientific talent does *necessarily* also possess the capability to carry out scientific research work of either a pure or applied nature, any more than everyone learning to play the violin could be a Paganini.) These are people who possess the sort of background which we could make good use of, and we should be making an effort to interest and attract them.

What better way to do this than to demonstrate the concern of medical librarianship not just with medicine alone but with the whole of science? Moreover, the *information* aspect of the work should be emphasized, for after all, this is where its main challenge will lie in the future, and also the main opportunity for the science graduate to feel that he is making a personal contribution to the area of principal interest to *him*. Such a demonstration can be given in the form of the courses planned for the education of future medical librarians, or 'health information scientists', or 'biomedical communications specialists', or whatever other designation is chosen for them.

We have to face the possibility that such programmes will lay increasing emphasis on subject knowledge. At a conference on health communications, a medical professor (Visscher, 1962) stated:

We cannot escape the need for very able people who know both the subject matter of the field and the modern mechanisms of communications; people who, on the basis of their substantive knowledge of science, can make the best sort of guess about how information must be classified, how it must be indexed, how it must be sorted and stored so working scientists will be able to get at that information when they want it. This requires a new profession in scientific communication. These professional communicators must, of course, occupy positions commanding the respect of the scientific community. But they will not command that respect until academic enterprises establish chairs for scientific communications or, more specifically, medical communications.

A more extreme view was taken at the same conference by another speaker (Garfield, 1962):

The conventional librarian does not have the medical or laboratory knowledge or insight necessary for evaluating information and for indexing it in such a way that it would be of most use to a variety of scientists. For this reason, the medical profession perhaps has an obligation now to begin training a new profession of medical information scientists.

A major difficulty in devising a suitable course is that of striking a suitable balance between all that one would like to see the student exposed to, and the practical limits of the time one can expect him to devote to this part of his training. The latter will be conditioned to some extent by the reward his labours will bring him afterwards. Human nature being what it is, the prospect of a suitable level of remuneration will be a strong inducement to study for the requisite length of time. Remuneration,

however, is a matter largely beyond our control; the product has to sell on its own merits. Nevertheless, the more far-sighted and adventurous employers can probably be persuaded to back a hunch if they know that a programme has been intelligently and imaginatively conceived and is in touch with the needs of the field. Note that I am not speaking here of 'training for the field' in the sense in which this term is usually used by library educators. It is the duty of the educationalist to look ahead and prepare his students not merely for the needs of today, but for those of the foreseeable future. (The failure to appreciate the significance of those last few words has been at the root of many of the misunderstandings that have occurred from time to time between educators and their colleagues in practice)

My talk today has deliberately been limited to bringing to your attention what seem to me to be very urgent and serious problems; I have made no attempt to provide any answers. There are two reasons for this. One is that the National Library of Medicine has already engaged David Kronick and Alan Rees (this volume, page 291) to investigate medical library manpower requirements in the U.S.A., and they will include a study of educational programmes, while I myself am hoping to make a study with a somewhat different approach, probably in the U.K.

It is my hope that today will provide an opportunity for us to hear your view on the situation that has been outlined. Possibly, too, some of you may be inspired to examine the problem as it affects your own countries: I hope you will, because it is unlikely that a single solution will meet every situation, and I think we would all benefit from a variety of approaches to a common problem.

Although I am by nature an optimist, I have been seriously concerned for many years about the unwillingness of many librarians to recognize the implications of the situation that is developing. This is why I have tried, whenever possible, to present my arguments through the words of some of the medical and scientific workers who have reflected on these developments. The underlying theme of my talk today has been summed up by Andrew Lasslo (1968) in terms which we should do well to heed:

> *If we should lack sufficient motivation or initiative . . . to respond to contemporary needs, the time may come when we will lose control over some of the important activities to* other *professional groups, and along with it, seriously damage our image of leadership in our own field of endeavor.*

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modifications of curriculum for biomedical libraries in library schools and incorporation of instruction in the newer information technology*

A. M. Rees

The social context within which health sciences librarianship is practiced has altered radically in recent years Modification in education for health sciences librarianship must be considered in relation to the forces which are transforming medical practice, education, and research Of basic importance in this connection is the intensified, awareness of health as a desirable and attainable national goal in the U.S.A. *First-class medical care is now regarded as a basic human right, regardless of income.* A rapid growth of the health care industry has resulted from a surge in demand for preventive care and treatment by all sections of the community due to an increase of individual health expectations. The total annual cost of U.S. health care is now 53 billion dollars, which represents 5.9% of the gross national product or 7.5% of all personal income. It is estimated that health services will account for approximately 7% of the gross national product in 1975. The number of hospitals is 7,167, with more than 1,000,000 employees. Some 14,008 health-sciences-related institutions and programs currently exist in the U.S.A.

Change is not only quantitative in nature. Patterns for the delivery of health care services are also in a state of transformation. The solo medical practitioner is rapidly being replaced by a constellation of specialists working within the context of specialized institutions, facilities, and systems which exist to provide comprehensive health care. The rise of specialization and the growth of the team approach to health care has resulted in the increased utilization of allied health personnel with competence to perform the more routine technical tasks associated with medical practice. Use of support personnel is of special importance in view of the scarcity of physicians. The Soviet use of feldshers has become particularly interesting in this connection.

The notion of medicine as a single, disease-oriented discipline concerned only with the restoration of individual health is being replaced by the concept of a conglomeration of health professions working in concert to foster and preserve the health of society as a whole. As the Coggeshall report (1965) has pointed out, 'The physician with his colleagues in public health, nursing, pharmacy, dentistry and related professions, can no longer represent the spectrum of service for the promotion of health. They must collaborate with social scientists, economists, community planners, anthropologists, social psychologists, engineers and a host of disciplines to provide for society the entire range of available preventive and therapeutic measures.' The factors that cause disease will not be found in the study of any one discipline.

Significant change is also taking place in the field of medical education. Traditional barriers between the basic sciences and clinical practice are disintegrating;

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clinical experience is introduced at an early stage in the curriculum; a variety of educational devices such as closed-circuit television, tapes, slides, films, and other media are now in widespread use; emphasis is placed upon independent learning and problem solving; the necessity for continuing education is an essential theme; and the medical educator and student are both acutely aware of the social responsibilities of the modern physician. 'The "new look" in medical education calls for the development of teaching and learning methods that are calculated . . . to inculcate in the student the ability to select, organize and evaluate information' (Wolf and Ware, 1965).

The expansion of biomedical research is another important factor influencing modern medicine. The magnitude of the budget of the National Institutes of Health is merely one index of the interest in and commitment to research. Although there are differences in opinion as to the relative emphasis to be placed upon research and practice, agreement exists as to the importance of the application of accrued biomedical knowledge in terms of improved patient care. It is increasingly recognized that a high level of health care for the total U.S. population cannot be assured without more rational and comprehensive planning on the part of the large number of health-related facilities, resources, institutions, programs, and services currently in existence. A more co-ordinated health care system is beginning to emerge at several levels, local, state, regional, and national. Systems analysis is being increasingly utilized in this connection.

These social, technological, educational, and political forces of change have great relevance to the practice of librarianship in the health sciences. The function of the librarian within the complex system of disciplines, individuals, institutions, programs, and services has to be considered within the total context of biomedical communication. The notion of the medical librarian serving only the *medical* component of the health care system must be replaced by the concept of the health sciences librarian who serves the total health community.

current system of education for health sciences librarianship

The system for education in health sciences librarianship in the U.S.A. is becoming more formalized and structured. Although many persons continue to enter health sciences libraries from other types of libraries, an increasing number are accepting employment in these libraries after completing formal educational requirements in health sciences librarianship. Two types of formal educational preparation exist: academic degree programs in schools of library science and post-degree internships.

academic degree programs

At the present time, instruction in health sciences librarianship is provided by means of specialization within the framework of the master's degree in librarianship. Various amounts of specialization are offered by the different library schools. In some, specialization consists of an introductory course in medical librarianship or a course in medical bibliography or both, while several schools have structured specialized sub-curricula comprising as much as 25% of the total course requirements for

the master's degree. Such formal programs have been fostered and catalyzed by the NLM, which has provided funding for innovative course design, development, and evaluation of educational programs in health sciences librarianship.

Library education at the professional level in the U.S.A. involves approximately one year of graduate education leading to the master's degree in library science. Admission to a graduate library school requires satisfactory performance in an undergraduate program culminating in a bachelor's degree. Forty-five graduate library schools are currently accredited by the ALA, and of these, 15 offer a course or sequence of courses in health sciences librarianship as part of the master's curriculum (Table I). A total of 20 courses are taught by 19 instructors in these 15 schools. Three basic types of courses exist: general introductory courses (Type I); medical bibliography courses (Type II); and those providing instruction in depth in specialized areas such as subject analysis in biomedicine or medical sociology (Type III). Eleven schools offer Type I courses; 4 schools offer Type II courses; and 2 schools offer a total of 4 Type III courses (Table II). No school offers courses of all three types. A detailed analysis of the subject content of these courses has been published elsewhere (Rees, 1968).

Table I. *Graduate library schools offering courses in health sciences librarianship in 1968 (data reported to the Association of American Library Schools by deans and directors).*

	Graduate library school	Number of courses	Number of instructors
1.	Case Western Reserve University	4	4
2.	Catholic University of America	1	1
3.	Columbia University	1	1
4.	Drexel Institute of Technology	2	1
5.	Emory University	1	1
6.	University of California at Los Angeles	2	1
7.	University of Chicago	1	1
8.	University of Illinois (Chicago Medical Center)	1	1
9.	University of Kentucky	1	2
10.	University of Michigan	1	1
11.	University of Minnesota	1	1
12.	University of North Carolina	1	1
13.	University of Oklahoma	1	1
14.	University of Pittsburgh	1	1
15.	University of Toronto	1	1
	Total:	20	19

Table II. *Types of courses in health sciences librarianship offered by graduate library schools (data reported to the Association of American Library Schools by deans and directors).*

	Graduate library school	Courses offered		
		Type I	Type II	Type III
1.	Case Western Reserve University	X		X
2.	Catholic University of America		X	
3.	Columbia University	X		
4.	Drexel Institute of Technology	X	X	
5.	Emory University	X		
6.	University of California at Los Angeles	X	X	
7.	University of Chicago			X
8.	University of Illinois (Chicago Medical Center)		X	
9.	University of Kentucky	X		
10.	University of Michigan	X		
11.	University of Minnesota	X		
12.	University of North Carolina	X		
13.	University of Oklahoma	X		
14.	University of Pittsburgh	X		
15.	University of Toronto	X		

Five graduate library schools, with financial support from the NLM, have developed training programs which represent, in effect, specialized sub-curricula in health sciences librarianship and information science (Table III).

internships

Internships provide a structured and supervised work experience for graduates of library schools, usually within the context of a biomedical library. One internship program permits the graduate to serve as a colleague on a research team in an appropriate department of the medical school. Another provides interns with the opportunity of participating in research and development work in the field of computers as applied to library operations.

Six institutions currently offer internship programs in health sciences librarianship (Table IV). Some formal course work is offered in connection with most of these programs, but the primary emphasis is placed upon a structured work experience in which the intern puts his theoretical knowledge to the test of actual library practice. Four of the internship programs are located in university medical center libraries; one is based in a department of a medical school; while the other is at the NLM.*
Some basic characteristics of these internship programs are shown in Table V.

* The Veterans Administration in 1960 initiated a work study program for the purpose of training medical librarians. In many aspects, this program can be considered as an internship, although no formal academic or research experience is provided. At present 20 VA hospitals are participating, some in close co-operation with the formal educational program of neighboring library schools.

Table III. *Academic degree programs with specialization in health sciences librarianship supported by the NLM Extramural Program (as of January 1, 1969).*

1. **University of California at Los Angeles**
   Professor Robert Hayes
   Program Director
   School of Library Science
   Los Angeles, Calif.

2. **University of Chicago**
   Dean D. R. Swanson
   Program Director
   Graduate School of Library Science
   Chicago, Ill.

3. **Case Western Reserve University**
   Professor Alan M. Rees
   Program Director
   Center for Documentation and
   Communication Research
   School of Library Science
   Cleveland, Ohio.

4. **University of Illinois**
   Professor Frances Jenkins
   Program Director
   School of Library Science
   Urbana, Ill.

5. **University of Minnesota**
   Professor W. Simonton
   Program Director
   School of Library Science
   Minneapolis, Minn.

The academic degree programs with specialization in medical librarianship are not designed as a prerequisite to or a steppingstone into the internship. Instead, the degree programs and internships exist as alternative avenues of entry into medical library practice, equal but different. In most cases, persons entering upon internships have had no prior specialized training in health sciences librarianship; and in most cases, students graduating from schools which offer a training program in medical librarianship have entered directly upon employment.

health sciences librarianship as a specialization

Specialization within librarianship is both possible and desirable, and the growth of health sciences librarianship as a unique educational entity reflects a trend toward specialization in library education in general. To quote Paul Van Riper (1967), 'The concept of a librarian as single entity, a uniform product, equally competent in all aspects of the profession is now completely outmoded. Like hospitals, libraries as institutions are now demanding a broad range of skills, many of them highly technical and deserving of specialized training in their own right.'

Table IV. *Internship programs in health sciences librarianship supported by the NLM Extramural Program (as of January 1, 1969).*

1. **University of California at Los Angeles**
   Miss Louise Darling
   Program Director
   Center for the Health Science
   Los Angeles, Calif.
2. **Wayne State University**
   Dr. Vern Pings
   Program Director
   School of Medicine Library
   Detroit, Mich.
3. **Johns Hopkins University**
   Dr. Alfred Brandon
   Program Director
   School of Medicine Library
   Baltimore, Md.
4. **University of Tennessee Medical Units**
   Dr. Andrew Lasslo
   Program Director
   Department of Medicinal Chemistry
   Memphis, Tenn.
5. **Washington University**
   Dr. Estelle Brodman
   Program Director
   School of Medicine Library
   St. Louis, Mo.
6. **National Library of Medicine**
   Miss Carol Long
   Training Officer
   Bethesda, Md.

This is not to argue that the objective of library education should be to train individuals for narrow specialties within librarianship; rather, the principal purpose should be to train individuals to think analytically, comparatively, and creatively with respect to the practice of librarianship. Any conception of specialization should be viewed within this context. The design of specialized library education must be based upon a carefully structured sequence of courses which encompasses the essential principles of librarianship. The provision of such a fundamental frame of reference is most likely to lead to judicious and prudent application of library principles and techniques in the various areas of librarianship. Specialized training can be carefully articulated within this basic instruction by the institution of courses and seminars in the specialty and the provision of field work and field trips by way of 'clinical' experience.

The application of the principles and techniques of librarianship must be made in an imaginative manner, taking full cognizance of the capabilities and limitations of modern information technology. The development of computerized information retrieval and dissemination systems, and the emergence of nascent national and

Table V. *Characteristics of internship programs (data provided by program directors).*

	Date initiated	Number graduated	Number 1968/9	MLA approved	Rotational	Formal course work required	Research opportunities
University of California at Los Angeles	1961	22	4	Yes	Yes	Yes	Yes
Washington University	1966	7	4	Yes	No	Yes	Yes
Johns Hopkins University	1967	4	4	Yes	No	Yes	Yes
University of Tennessee	1966	5	6	Yes	Yes	No	Yes
Wayne State University	1967	2	3	Yes	Yes	No	Yes
National Library of Medicine	1957	24	3	Yes	Yes	No	Yes

regional information networks possess obvious relevance to the conduct of health sciences library practice.

Thirty-five of the 45 ALA-accredited library schools now offer at least one course in information science (Rees, 1969). Three major areas of emphasis exist in these courses: library automation (theory and application of automation to library processes and procedures such as acquisition, serials, circulation control, catalog production); information storage and retrieval systems (design and evaluation of systems, subject analysis, file organization, search strategy, dissemination); information science research methodology (basic principles of mathematics, linguistics, statistics, psychology, and other disciplines, and their application to the investigation of library-based and communication-related phenomena). In 1967, 17 schools offered 25 courses in library automation; 19 schools offered 39 courses in information storage and retrieval systems; 6 schools offered 13 courses in information science research. Most schools now offer at least one course in one or more of these areas.

The 15 schools offering specialized training in health sciences librarianship are particularly rich in information science offerings: 65 courses in the 3 areas of library automation, information storage and retrieval, and information science research methodology are taught in these schools by 47 instructors. The number of courses and instructors are shown in Table VI. These courses in information science and technology, whether required or elective, have enriched the curriculum in health sciences librarianship.

the specialty of health sciences librarianship

Until quite recently, specialization in health sciences librarianship (like other library specialties) consisted of an introductory course in which students were introduced to the bibliography and operation of libraries in a special field. But, i

Table VI. *Number of information science courses offered by graduate library schools providing training in health sciences librarianship (data reported to the Association of American Library Schools by deans and directors).*

	Number of courses	Number of instructors
Case Western Reserve University	11	7
Catholic University of America	2	1
Columbia University	3	2
Drexel Institute of Technology	5	4
Emory University	2	3
University of California at Los Angeles	6	2
University of Chicago	8	3
University of Illinois	3	2
University of Kentucky	3	1
University of Michigan	4	4
University of Minnesota	3	3
University of North Carolina	2	3
University of Oklahoma	1	1
University of Pittsburgh	7	7
University of Toronto	5	4
	65	47

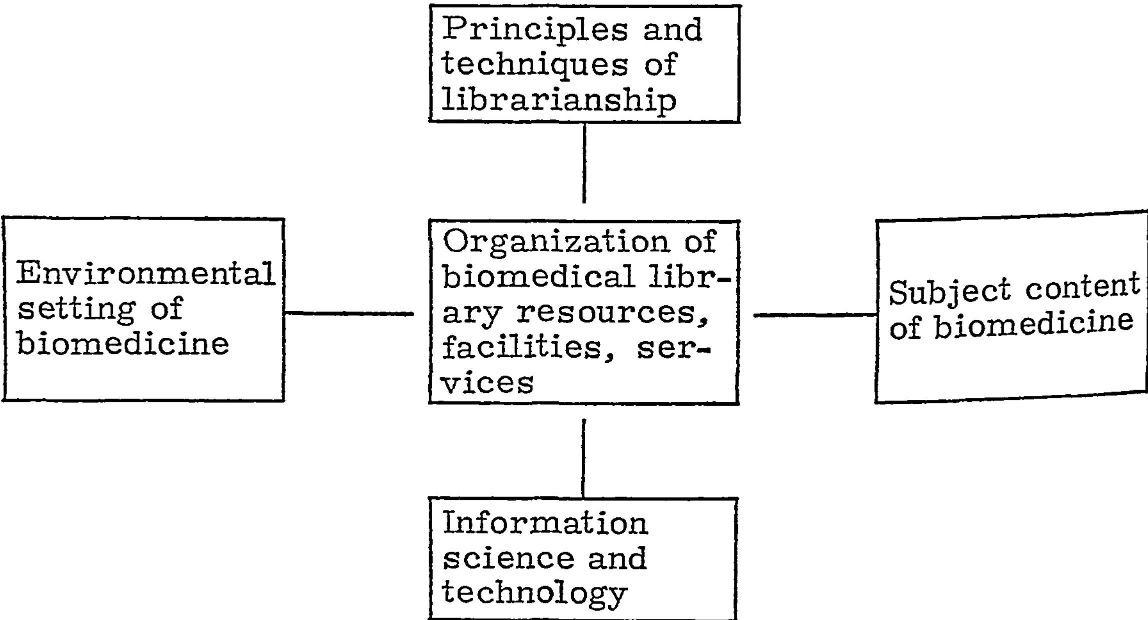


Fig. 1. Health sciences librarianship as a specialty.

past three or four years there has been a gradual coalescence of a body of subject matter which educators and others believe to be the essence of health sciences librarianship. Built upon the base of library science plus information science and technology, as outlined above, this subject matter consists of three major areas of specialized knowledge (*see also* Fig. 1): environmental setting of biomedicine; subject content of biomedicine, and organization of biomedical library resources, facilities, and services.

environmental setting of biomedicine

The interpretation and application of library principles and concepts within the operational context of the biomedical community constitutes the essence of training in health sciences librarianship. More than knowledge of library tools and techniques is required.

The health sciences librarian must possess an understanding of the environmental setting of medicine and medical practice in addition to knowledge of library materials and techniques. He must understand who the physician is and what he does, what social and institutional pressures and restrictions influence his decisions and his actions, and even the kind of education he receives. Only then can he meet the physician's information needs with effective library service. He must understand the relation of research to practice, not only in librarianship, but also in medicine. He must know what resources — conventional and non-conventional — are available to him and to his clientele, not only in his own field, but also in medicine. He must be aware of the communications network operating not only in his own field, but also in medicine; for he is the communications expert, the intermediary equipped with special knowledge and tools who works in a subject area which is the speciality of the physicians, educators, and researchers he serves.

subject content of biomedicine

Education in biomedicine can never be a major objective of library schools. However, health sciences librarians must comprehend the subject content of biomedicine, the intellectual and bibliographic structure of the various disciplines, and the nature of the activity in each field.

Students can be expected to have had some education in the health sciences prior to entry into library school, or to be sufficiently motivated to educate themselves in this area. However, a number of schools are providing instruction in biomedical terminology as part of the health sciences librarianship curriculum, while students are encouraged to take courses in biology and other disciplines offered by university departments. Most internships also offer students the opportunity to take such courses. In the internship program at the University of Tennessee Medical Units in Memphis, terns serve as members of research teams and participate in the actual design and execution of biomedical research.

organization of biomedical library resources, facilities, and services

Knowledge of the principles and techniques of librarianship and information science, the subject content of biomedicine, and the environmental setting must be

applied to the design, operation, and evaluation of operational health sciences library services. Such application necessitates an understanding of the bibliography of the health sciences, specialized indexing and abstracting services, retrieval systems in biomedicine such as MEDLARS, information centers in biomedicine, classification and cataloging tools, and the management of library resources and facilities in health sciences institutions. An understanding of the structure of local, regional, and national biomedical library networks is of great importance, since the relationships between network components, such as hospital libraries, university medical center libraries, regional medical libraries, and the NLM, have great significance in the provision of library services.

Instruction within this area is best provided by persons actively engaged in the management and provision of library services. Most library schools with specialization in health sciences librarianship have part-time faculty members who are engaged in library practice in this area.

current trends in education for health sciences librarianship

subject content

A consensus appears to exist that education for health sciences librarianship should incorporate instruction in the principles and techniques of librarianship and information science, the biomedical environment and medical sociology, and the subject content of biomedicine. However, considerable disagreement continues concerning the emphasis to be placed upon each of these areas. The amount of information science and technology which should be introduced into the curriculum for health science librarians is far from clear. The extent to which the health sciences librarian should be versed in medical sociology has not been determined, while the depth of subject knowledge required has been debated for decades in all fields of library practice. The peculiar admixture of these areas in any given library school curriculum or internship is dependent upon the educated judgment of the program director and supporting faculty and the resources of the university or host institution.

mode of educational preparation

The relationship between specialization in health sciences librarianship within the master's curriculum and the internship is still imperfectly understood (Brodman, 1968). If an academic degree program can infuse an amount of supervised work experience and orientation within an operational biomedical library context, is an internship really necessary? Graduates of the specialized degree programs display a reluctance to invest an extra year in an internship which (presumably) they feel duplicates some aspects of the master's program. Most persons enter the internships from schools with no specialization within the master's curriculum.

On the other hand, internships have introduced many of the elements of the academic degree programs by way of formal courses in information science, librarianship, and health sciences librarianship. It is evident that students in the academic degree program in library schools and interns in biomedical libraries are obtaining a similar educational experience and probably do not need both.

intra-university co-operation

Education for health sciences librarianship cannot be provided by a library school or biomedical library alone. In the first instance, it is arid and divorced from the live environment in which health sciences librarians work; in the latter instance, it is an apprenticeship rather than an enriching educational experience. Education for health sciences librarianship has been most rich and comprehensive when library schools have entered into co-operative arrangements with biomedical libraries and medical schools. Moreover, the involvement of medical school faculty is particularly productive from a pedagogic point of view, in that many of the problems faced by library educators have already been defined and explored by medical school educators. The assistance of medical school faculty engaged in biomedical communication has been particularly helpful. The dialogue resulting from co-operation among library schools, medical schools, university departments (such as biology, psychology, sociology), and biomedical libraries has been most fruitful.

The internship programs also draw heavily upon the resources and facilities of the universities of which they are a part. One internship program requires its interns to take courses in the library school within the same university, and other programs have similar requirements. The support of the medical school faculty is readily available.

clinical experience

Most academic degree programs have recognized the need for clinical library experience to illustrate the application of principles and techniques within the context of library practice. Emphasis has been placed on the provision of supervised observation and field experience in biomedical libraries for students. The provision of such field work also serves to introduce students to a variety of health sciences libraries such as medical school, dental school, nursing school, community hospital, and Veterans Administration.

The involvement of practicing librarians from the community in the development of educational programs has been most beneficial. Most programs have drawn upon the facilities, resources, and skilled personnel of local libraries. For example, fifteen community hospitals and two VA hospitals co-operate with Case Western Reserve University in the provision of clinical library experience (Smith, 1969).

research experience

Most educational programs have introduced a measure of research experience into the curriculum; this is true of both the academic degree programs and the internships. Emphasis upon research stems from the conviction that library education must accept the responsibility for educating persons capable of professional activity over and above the well-established routines and procedures. Graduates must possess the competence to analyze library environments and to define the basic variables involved. Unfortunately, the emphasis in library education has been placed *not* upon problem solving and system analysis, but rather on the execution of immutable routines and techniques. Such an emphasis leads inevitably to a lack of innovation

in library practice and professional obsolescence. Few library school graduates can define the objectives of a given library function in formal terms, derive alternative procedures for accomplishing these objectives, and make an evaluation of them.

Accordingly, several educational programs have provided a research practicum through which the student can gain insight into research design and methodology. In at least two schools this practicum is closely integrated with research projects currently in progress in the area of health sciences librarianship and biomedical communication. Students are provided with the opportunity of participating in these research projects. It is believed that such research participation and experience will lead to an upgrading of professional library practice in the health sciences.

influence of the national library of medicine

There can be no doubt that education in health sciences librarianship has been considerably strengthened and expanded by the Medical Library Assistance Act administered by the Extramural Program of the NLM. The funding of academic degree programs and internships has paved the way for the structuring of health sciences librarianship as a specialization, the definition of subject content, the integration of information science, the design of innovative courses, the development of strong co-operative relationships with medical schools and other departments of the universities, the initiation of a number of research projects in biomedical communications as adjuncts of educational programs, and the extensive use of field work, field trips, and seminars.

There is a growing sentiment within library schools that health sciences librarianship is a pacesetter and may offer a model for a similar specialization in other fields such as law librarianship. The provision of stipends to students and other forms of financial aid has resulted in recruiting young persons with academic excellence in a variety of undergraduate subject areas.

Thirteen academic institutions are currently in receipt of training grants in health sciences librarianship and biomedical communication. Five of these are supporting academic degree programs and five are internships, while the remainder are supporting programs in biomedical editing and communication. By the end of the calendar year 1968, stipend awards had been made to 150 students, of whom 50 had completed their training. Virtually all of these graduates have accepted employment in libraries and information systems in some field of biomedicine.

continuing education programs

Continuing education is becoming increasingly important in health sciences librarianship. Both the MLA and the AHA have been very active in this area (Gartland, this volume, p. 315; Watterson, this volume, p. 308). Continuing education, as it is presently offered by the MLA, is directed primarily toward *professional* library personnel. A preliminary analysis of a questionnaire completed by 292 participants in the 11 courses offered in June 1968 at Denver at the Annual Meeting of the MLA indicates that 164 individuals possessed a degree in library science, 85 individuals possessed a college degree (graduate or undergraduate), 7 individuals had completed

a 2-year college program and 28 individuals had completed high school.* Of the participants, 63.04% felt that the practice of health sciences librarianship was changing a great deal, 23.43% believed that it was changing moderately, while 0.35% felt that it was not changing at all. First three choices in terms of preferences for continuing education were, in the area of techniques and tools of library science, reference (38.81%), cataloging (18.18%), and MEDLARS (13.29%). In the area of new developments in librarianship, the first three choices were library automation (25.83%) regional medical library programs (16.43%), and library research (16.42%) In the area of developments in medicine the first three choices were medical research (25.52%), medical terminology (23.78%), and regional medical programs (20.28%).

It is clear that the continuing education program of the MLA builds upon the basis of prior educational experience in library science and that it serves a very useful purpose in upgrading the quality of medical library practice.

The continuing education program of the AHA is aimed at a less sophisticated audience in terms of general educational background and library training. For example, of a total of 271 hospital librarians in Ohio, only 22 (8%) have had any formal library training. The problem with regard to the potential audience of hospital librarians is not one of *continuing* education but, rather, one of basic education. Continuing education is a misnomer in that this implies building upon prior educational experience which is absent in most cases.

relevance of educational programs

The crisis in health manpower in the U S.A. is well known. The *Report of the National Advisory Commission on Health Manpower* (1967) has analyzed the salient issues. By 1975, 3.4 to 3.6 million health workers will be required. To meet this need, a net increase of about 100,000 health workers a year is necessary, which represents a growth rate 50% higher than it has been during the past decade.

Within this general context of scarcity, a severe shortage of health sciences librarians exists. The magnitude and nature of this shortage is under investigation by Dr. David A. Kronick (this volume, p. 291) of the University of Texas Medical School at San Antonio and the present author, with financial support from the NLM. The objectives of this investigation are to document the demand, supply, and utilization of the present work force in order to provide a data base for projection of future manpower requirements on both a short-term and a long-term basis. Analysis of the functions and tasks performed by present manpower will result in the specification of levels of professional and non-professional activity. Educational requirements, including the design and evaluation of appropriate educational programs, will be studied in relation to the levels of activity identified.

Preliminary data gathered by the Texas-Case Western Reserve manpower investigation indicate that there are 14,008 health-related institutions in the U.S.A.

* In addition there were 2 non-respondents. The questionnaire was designed at Case Western Reserve University in connection with the manpower investigation described below, and was administered through the co-operation of the MLA. The complete data and an analysis of the MLA participants will be published (Rees and Rothenberg, 1970).

It appears that there are some 2,069 libraries in 6,841 non-hospital, health-related institutions. It is probable that there are some 6,000 personnel employed in these 2,069 non-hospital libraries. To this total may be added about 3,700 persons employed in approximately 3,000 hospital libraries in some 7,167 hospitals. Accurate data will be available in the near future, but it appears that the total health sciences librarian population is in the neighborhood of 9,700 (Kronick *et al.*, 1970; Rothenberg *et al.*, 1970).

Many health-related institutions have no libraries because they cannot find staff; many others which do have libraries have no professionally trained librarians; and of the trained librarians with master's degrees, very few have specialized in health science librarianship. Our preliminary data show that the formal educational programs described in this paper are *not* the major source of practicing librarians in the health sciences, and that indeed they have produced less than 15% of the present work force. The ratio of professionally trained librarians to untrained personnel is calculated at approximately 1 : 7 (Rees *et al.*, 1968). This would mean that only 1,212 of the estimated total work force of 9,700 are professionals. This may not be an undesirable proportion, since many jobs are — and probably will continue to be — at the non-professional level. However, it is clear that the existing educational programs with an output of only 100 per year cannot satisfy even the current demand for professional personnel, and that an alarming number of persons performing library functions have had little or no formal training in any area of librarianship.

The optimum utilization of professional manpower is of prime significance to health librarianship as it is to the health sciences in general. A restructuring of the library profession is long overdue, and a precise definition and professional recognition of the role of supporting personnel is imperative. Recently, Asheim (1968) defined several levels of library functions, but his recommendations have yet to be adopted by the ALA.

The significance of the current library manpower debate in the U.S.A. to the field of health sciences librarianship is that one can no longer argue the necessity and desirability of employing one kind of *professional* health sciences librarian in all types of health sciences libraries in all categories of health-related institutions at all levels of library functions. A more refined definition of professionalism is required which recognizes a number of levels of library functions, some of which will be supportive in nature at the non-professional level.

It is also possible to arrive at a restructuring of professional health sciences library manpower in terms of a differentiation of roles within levels. In addition to the role of library *practitioner* engaged in cataloging, reference, interlibrary loan, there is the *library specialist* with expertise in areas such as systems analysis, computer technology, and network design. Other roles include the *information specialist* with subject knowledge and research experience in biomedical disciplines, and the library *educator and researcher*. At the non-professional level it might be optimum to arrive at a similar differentiation of roles.

Once a differentiation in terms of levels of function and roles is recognized, the design of educational programs becomes more easily accomplished. Appropriate curricula and course offerings can be provided for the several levels and in relation

to the roles identified. It is evident that many educational programs are specializing in preparing persons for a specific role, whether practitioner, specialist, or researcher, but only at the professional level.

It is vital to identify the need for more than one type of professional in health sciences librarianship and a corresponding differentiation in terms of educational preparation. The present educational preparation of health sciences librarians reflects an increased awareness of this differentiation and the need to escape from the notion of a homogeneous librarian capable of performing professional and semi-professional functions in all types of health science libraries in all kinds of institutional settings.

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health sciences library manpower and educational needs in the united states: a preliminary report*

D. A. Kronick, A. Rees and L. Rothenberg

The shortage of health care manpower in the U.S.A. has reached crisis proportions. It is apparent to the present authors that any study of health sciences library manpower must be placed within the context of this more general manpower crisis in the health care industry in the U.S A. It is also clear that the role of the health sciences librarian must be related to the explosive growth of biomedical knowledge and to the need to facilitate its communication to members of the health care team.

A number of specific factors have contributed to the current sense of urgency regarding health sciences library manpower. Recognition of the significance of effective communication within the health sciences has resulted in a more clear understanding of the importance of library services in relation to patient care, training, and research. In this connection, the Regional Medical Program, established under P.L.89-239, emphasizes the co-ordination of patient care with health research, education, and information among medical schools, medical centers, community hospitals, and other health institutions, organizations, and personnel. Also, provision of continuing education for physicians in order to maximize the quality, efficiency, and productivity of medical practice has become a national concern, thereby creating a demand for more extensive library services.

The growing importance of the hospital as a focal point in the delivery of health care services in the U.S.A. also exerts a significant influence upon the demand for library services. The traditional hospital is being transformed into a complex of educational and research institutions. Approximately two million persons, about two-thirds of all health service workers, are employed in hospitals.

Additional demands on library resources and services arise from the increase in programs established to train personnel for the allied health occupations. A list of allied health occupations recently compiled by the National Center for Health Statistics of the PHS contains 268 separate job classifications. The Bureau of Health Manpower estimates that by 1975 there will be a million more persons in the health occupations than in 1966. Supporting library services must be provided for these training programs and for the continuing education of their graduates.

Also of significance with reference to library manpower are the decentralization of the MEDLARS program of the NLM and the establishment of regional medical libraries. These programs are forcing a formalization of library services and an up-

* Work supported by PHS Grant LM 00493-01 through the Extramural Program of the National Library of Medicine to the University of Texas Medical School at San Antonio. Dr. Kronick is Principal Investigator, Professor Rees is Co-Principal Investigator, Mrs. Rothenberg is Project Manager. The assistance and suggestions of Mr. Herbert Fockler, Training Grants Officer, Extramural Program, National Library of Medicine, are gratefully acknowledged.

grading of library practice with a consequent demand for more adequately trained personnel at the national, regional, and local levels.

It is evident that the design and successful implementation of a national biomedical library system is dependent upon the adequate provision and utilization of library manpower, now in short supply. National planning with respect to the training, allocation, and utilization of manpower can proceed satisfactorily only if an adequate data base regarding present and projected manpower requirements exists for effective decision making. Such a data base can only be derived empirically.

manpower problems and issues

Certain basic questions underlie any discussions of library manpower and educational needs:

1. What are the numbers and characteristics of the present work force? What is the annual input into the profession through the pathways of present educational programs? What are the current and projected demands for manpower? Does the gap between supply and demand constitute a crisis?

2. To what extent is library practice shifting in objectives, organization, and services, and how will these changes influence the demand for manpower? What types of skills and expertise will be required to perform the basic functions of future library systems?

3. Is the present work force under- or over-utilized? Is the solution to the manpower crisis to train more professionals or to work toward a 'downward transfer of functions?' Do professionals really need to do what they are presently doing? Are all tasks performed by personnel *professional* tasks? Is it possible to construct a classification of professional and non-professional tasks reflecting a differentiation of knowledge and skills necessary for effective performance?

4. Are existing modes of education relevant to the present utilization of manpower, and how do they relate to projected needs? Can levels of specialized training for health sciences library manpower be specified? To what extent should a differentiation be made between present *demands* and future *needs* in the design and implementation of educational programs?

These are complex questions which defy simple answers. The library profession has been most negligent in defining its manpower needs, in specifying 'professional' tasks, and in establishing norms and standards of educational preparation for persons entering library practice. The sharp differentiation in library lore between professional and non-professional personnel represents an over-simplification with scant empirical basis. Professional librarians have not accepted the responsibility for defining non-professional tasks and appropriate educational programs. It is clear that a restructuring of library professionalism is long overdue. The concept of library education has to be broadened to include the responsibility for educating the non-professional.

Considerable interest in health sciences library manpower and education has been shown by the MLA, the AHA, and the NLM. In addition, a number of universities have developed educational programs in health sciences librarianship to supply the profession with appropriate personnel.

Several biomedical libraries have developed internship programs. Both the MLA and the AHA offer short courses and workshops to fill a continuing education function, and the popularity of these courses reflects the expressed need for formal training by practitioners.

In the absence of a systematic understanding of health sciences library manpower requirements, these educational efforts represent an uncoordinated, *ad hoc* approach to the total problem. Without basic manpower data, any consideration of the fundamental issues of manpower utilization, structuring of professional and non-professional tasks, and design of appropriate levels of educational preparation can only be short-term and unsystematic. The analysis of manpower requirements is further complicated by the fact that no complete and accurate listing of biomedical libraries is available. The absence of such a listing presents an obstacle to the gathering and analysis of manpower data. Several intermediate steps must be accomplished involving an identification of medically-related institutions, determination of the existence of libraries within these institutions, and compilation of a register of persons employed within these libraries.

objectives of manpower project

A research investigation, initiated in April 1968 by the University of Texas Medical School at San Antonio and Case Western Reserve University, has as its purpose the systematic gathering of health sciences library manpower data and the investigation of educational needs. A major objective in the initial stages of the investigation is the compilation of an accurate inventory and description of present manpower. Four major areas of interest exist: *characteristics of the current work force* in terms of geographic distribution, age, sex, marital status, educational and work experience, attrition, job mobility, tasks performed, source of recruitment, and entree into library practice; *existing and anticipated position vacancies* by job title and skills required, by type of employing institutions, by salary range, and by geographic distribution; *inventory of current educational programs* in training health sciences library personnel and information specialists at all levels (graduate, undergraduate, technician, etc.); and *identification of forces of change*, internal and external to library practice, likely to modify health sciences library practice and the demand for personnel.

Two types of information are specified in this study: objective (factual) data, and subjective (attitudinal) data. Objective data will provide a basis for describing the current situation with regard to number, type, and distribution of positions, specified job vacancies, current educational programs, present work force, etc. Subjective data will provide evaluative information relative to the compatibility of educational programs and required job skills, the ability of the present work force to adjust to a changing environment, the disposition toward innovation on the part of those responsible for the design and implementation of training programs, both as regards technological change and modification in concepts of professionalism, etc. Emphasis

has been placed in the initial stages of the project on the gathering and analysis of subjective data.

In this connection, a clear differentiation is made between *needs* and *demands* for manpower. There is a difference between meeting needs as defined by the profession, and demands as expressed by employing institutions. The concept of 'need' is an evaluative concept predicated upon professional norms and expectations, whereas the concept of 'demand' is generally predicated upon a description of observable events. In many instances, of course, demand may be a partial function of a professional definition of 'need'.

The major concern of the investigators up to the present time has been with the task of documenting the nature and extent of existing supply and demand. The production of a complete inventory and description of present manpower in terms of supply, demand, and utilization is a necessary prerequisite for an accurate assessment of future manpower needs and levels of educational preparation. While it is recognized that no scientific methodology exists for predicting educational needs and manpower requirements, the quality of the 'intuitive leap' from data relating to demand to prediction based upon perception of need depends upon the reliability and completeness of relevant empirical data regarding the current manpower situation.

methodology and progress to date

The methodology utilized has stressed a systematic, limited, and controlled approach. Factors of scope and depth in data gathering have had to be balanced against each other and intermediate goals established. Five basic steps are involved in implementing the major objective of producing an inventory and description of current manpower: definition, identification, and statistical analysis of health-related *institutions;* definition, identification, and statistical analysis of health sciences *libraries;* identification of health sciences *library personnel* and compilation of a register of these persons; statistical description of health sciences *libraries* identified based on gross estimators of personnel, resources, budget, users, and services; and statistical description of health sciences *library personnel* in relation to demographic factors, educational background, work experience, and current job duties. The basic steps involved in the research design are illustrated in Fig. 1. An amplification of these steps, specifying the actual phases of effort, their sequence, and the relationships between operational tasks are shown in Table I.

Actual implementation of the research design began in April 1968 with the definition and identification of the institutional population to be surveyed. Health-related institutions were defined as those engaged in patient care, education, research, manufacture, and professional activities. Sources used for identifying institutions included membership rosters of various professional organizations; lists of schools of the health sciences and credited paraprofessional educational programs; directories of service organizations, manufacturers, research institutes, governmental agencies, etc. It is estimated that approximately 80% of all such institutions in the U.S.A. and its possessions have been identified.

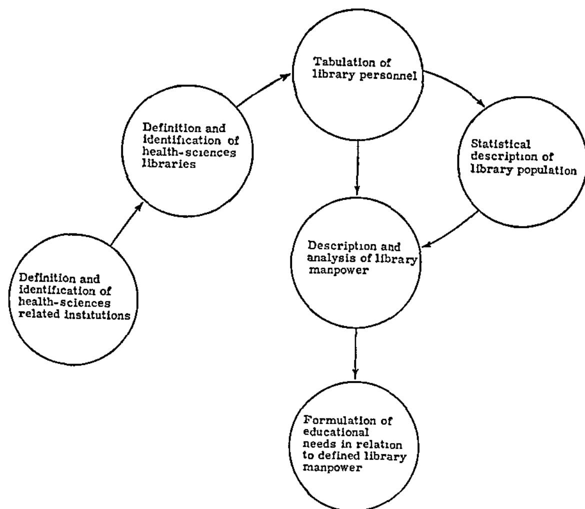


Fig. 1.

A total of more than 14,000* institutions has been identified in Phase I of the investigation. Table II shows the major classes of institutions included. A coding scheme has been developed to characterize each institution and program in terms of its subject emphasis (medicine, dentistry, etc.), administrative control, public (federal, state, local) or private, and geographic location.

During August 1968, a postcard questionnaire was mailed to each institution requesting information as to whether it operated a library. If no library existed within the institution, the name of any other library providing services was requested. Returns from this questionnaire have revealed the existence of a large number of health sciences libraries and the extent of the inter-relationships between institutions in terms of library services. A library mailing list based on returns from the question-

* This figure includes 7,000 hospitals which were surveyed independently by the AHA for the purpose of gathering library data. A listing of hospitals with libraries will be supplied by the AHA to the present investigators to permit the subsequent gathering and analysis of manpower-related data.

Table I. *Outline of methodology.*

Phase	Objective	Operations and instruments	Analyses
I	Definition, identification, and analysis of health sciences-related institutions	Definition of population; comprehensive searching of directories, etc; encoding of population by: 1. administrative control 2. type 3. subject specialty 4. geographic distribution	Statistical and descriptive analyses of population
II	Definition, identification, and analysis of health sciences libraries located in, or serving, the institutional population	Postcard questionnaire to institutions (Phase I) re: library; compilation of library population; collating institutional codes with libraries	Statistical and descriptive analyses of population based on institutional codes; analysis of non-respondents to postcard
III	Definition, identification, and analysis of gross indicators of library operation; compilation of a register of library personnel	Basic questionnaire to all libraries (Phase II) soliciting quantitative data in relation to: 1. personnel 2. resources 3. users and services 4. budget	Statistical and descriptive analyses of data from basic questionnaire
IV	Investigation of library personnel	Secondary questionnaire to personnel regarding: 1. demographic factors 2. education 3. work experience 4. job duties 5. attitudes toward continuing education	Statistical and descriptive analyses of personnel data, analyses of population for sampling purposes for further attitudinal questionnaires

Formulation of educational needs in relation to defined library manpower

Table II. *Health-related institutional population.*

Classes of health-related institutions	Members of classes
Treatment and services	hospitals public health agencies medical clinics specialized health care centers service organizations and specialties, etc.
Educational	professional schools (medicine, dentistry, etc.) paraprofessional schools and programs (medical technology, X-ray technology, etc.)
Research	non-profit, biomedical research institutions
Manufacturers and pharmaceuticals	chemical companies drug companies instrumentation, manufacturers, etc.
Professional organizations	American Medical Association, etc.
Independent libraries and information centers	National Library of Medicine, John Crerar Library, Parkinson's Disease Information Centers, etc.

naire is currently being produced by computers for the purpose of initiating Phase III of the project — production of a directory of library manpower.

A questionnaire, to be sent to the health sciences libraries identified in Phase II, is now (December 1968) being pre-tested and will be mailed in January 1969.* This instrument is designed to produce a brief statistical characterization of each library, in terms of numbers of personnel, library resources (volumes and current serial titles), operating expenditures, library users and services, and to provide the names of all professional and non-professional library personnel. It is estimated that some 3,000 libraries will be surveyed in this phase.

In March 1969 it is anticipated that a questionnaire will be mailed to each person identified in Phase III. This instrument will gather data with respect to education, work experience, job functions performed, work attitudes, preferences for continuing education, etc.

future effects

It is anticipated that a complete directory of health-related institutions will be available in June 1969, together with an accurate listing and description of libraries and personnel. Data will be in machine-readable form and tapes and listings of the population will be provided by type of institution, administrative control, and geographic location (regional, state, county, etc.). The extent to which institutions have access to library services will be indicated, so that deficiencies in both manpower and library services can be identified.

* This questionnaire is being developed and tested as a joint effort with an investigation currently being conducted by the AMA and the University of Wisconsin at Milwaukee (Mrs. Susan Crawford and Dr. Frank Schick, Principal Investigators). The AMA study is endeavoring to devise a methodology for a continuing survey and statistical analysis of health sciences libraries in the U.S.A.

The existence of a data base of present manpower, its distribution and characteristics, will provide a more adequate foundation for estimates as to the types of manpower required both on a short- and long-term basis. Analysis of the functions and tasks performed by present manpower will permit the specification of levels of professional and non-professional activity. Educational requirements and the design and evaluation of appropriate educational programs will be studied in relation to the performance and classification of tasks identified.

continuing education for medical librarians: recent united states experience

J. W. Felter

It has been said that 'a college graduate's accumulation of knowledge at the time of graduation has a half-life of ten years (1).' Obsolescence of professional knowledge may be due in part to lack of use of all that he has learned, because only librarians in very small libraries, where they have no professional assistants, have the opportunity or need to use the full gamut of their skills. Others have choice of types of work and tend to choose those that utilize their preferred skills. Obsolescence is due also to changes and advances in the field that at certain points in time occur with such rapidity and in such volume that it is difficult to adjust to the new professional climate, absorb the new philosophy, and adopt the new techniques. Such a changing environment has been enveloping medical librarians in the last decade or so, and, of necessity, along with it has come the 'adaptation syndrome' — continuing education.

In anticipation of this meeting, I tried to define the term, and, in the process, the concept seemed to widen rather than narrow. In the broadest sense, all life is continuing education. That, however, is an area too extensive for an afternoon's discussion. I have, therefore, narrowed it to the following: continuing education is the learning activity in which one engages after he has enough schooling to assume responsibility for a particular job in his chosen field. In many professional instances, arrival at that stage is marked by receipt of one's first collegiate diploma. The term needs further refinement, however, because it is subject to various interpretations.

Continuing education in the context of this program is not to be confused with in-service training. In-service training is not only task-oriented, it also applies to a particular function in a particular library. The learning is no doubt transferable to some extent, but it may not be 100% transferable, because no two libraries are exactly alike. Continuing education is not synonymous with formal graduate study, either, that is, pursuit of an advanced degree. As we are thinking of it today, continuing education is unstructured, dictated by the individual's own motivation, and does not lead toward an academic degree. Continuing education may be a concomitant of research, but less often in librarianship than in other branches of the academic world (2). There is less research in librarianship, because in libraries there is less money to support it; the rigidity of library schedules and the uneven balance between personnel and service load do not permit time for it; and librarians are less subject to the doctrine of 'publish or perish'. Sometimes the academic climate is simply not favorable to library research. So much for what continuing education is not.

The continuing education of which we speak today is, as I see it, characterized by the following: it may be task-oriented, to be sure, as in a MEDLARS workshop or an introduction to the use of the MARC II format, but it is pertinent to a broad spectrum of libraries rather than only one. The program may be planned and implemented by an academic institution, but it is not part of the standard curriculum and is rarely given, or taken, for course credit. It is as likely to be planned and executed by a professional association, or a division of one, or a library or organization initiati

a new service, like the National Library of Medicine or the IBM Corporation. And participation is mainly voluntary. Continuing education of this kind may serve a number of purposes: it may be 'foundation learning', needed when entirely new concepts, such as data processing, initiate a new phase of librarianship; it may be 'remedial learning', sometimes called refresher courses, to strengthen weak areas or refresh the memory; it may be 'emergency education' when librarians need new techniques for new responsibilities; finally, it may be preparation for specialization. Some programs are an effort to come to grips with the 'problem of an alarming shortage of trained librarians' (3). Whatever the purpose and whatever the program, ideally it should be characterized by a 'reduction of resistance to change'.

The success of the current continuing education program of the Medical Library Association, to which Dr. Brodman has alluded (this volume, p. 301), has like its predecessors been due to the imagination, hard work, and devotion of a great deal of time — purely voluntary — of members of the Association. Mr. Watterson (this volume, p. 308) has described the current program in detail.

One of the difficulties of planning continuing education programs, such as Mr. Watterson described, is the design of courses for an audience that lacks homogeneity. The programs described by Mr. Gartland, on the contrary, do not have this disadvantage; the background of the members of the audience is fairly predictable. The librarians for whom the first of these programs is planned are indeed more homogeneous than any other group I know of in the U.S.A. The health facilities in which they work are under a central administration, and, although local individuality exists, they have common environment and purpose. The first program illustrates the specialization aspect of continuing education.

The second program is the result of the aforementioned need to come to grips with the shortage of trained library personnel. The audience to which this program is addressed is also homogeneous; the members do not have professional library education, though they must be working in hospital libraries to qualify. It is basic, but not formal, training.

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the medical library association's experience with continuing education

E. Brodman

It has been said that every artist really has only one subject, and that his lifetime is an endless effort of making variations of the same idea In this theory, creativity is the relative success with which the artist is able to carry off a play of changes on his singular idea. Without claiming for myself the status of artist, I wonder if, so far as the International Congresses on Medical Librarianship are concerned at any rate, I too have not been engaged in an endless effort of making variations of the same idea. In each International Congress I have talked about the education of medical librarians: in the First on the education developed at Columbia University; in the Second on education for medical librarians internationally; and now, at the Third, on the experience of the American professional association's experience with education for practicing medical librarians. I fear, if this sort of thing continues, that when next you see me rising and walking toward the lectern, you will all find you have an urgent engagement elsewhere, because you will know the tenor of my remarks in advance. (For those who wish a thumbnail sketch of my views, let me say I am for education and against ignorance everywhere.) I can only say in my defense that this talk was especially asked of me by the Association, so that in a sense I am the official spokesman of the group.

background

No education, of course, exists in a vacuum. What is taught to the young and the neophyte in any society is what that society conceives of as important for its continued growth; and much that is most valuable, as that society views it, is taught subtly and informally, without conscious efforts at the transmission of knowledge. I refer to such things as value judgments, attitudes toward strangers, politenesses and formalities, and food habits. Even what is taught in formal terms of teacher and student is tinged with the same pervasive, and often unmentioned, social consensus; and it therefore becomes necessary to discuss the American view of life in order to place the experiences of the Medical Library Association in continuing education in proper perspective.

Two main influences have been at work in the U.S.A. since its founding to influence the educational patterns it has developed. One is its fundamental philosophy — its *Weltanschauung* — and the other concerns the geography of the country. The United States was founded by Europeans influenced greatly by the philosophers of the Age of Enlightenment, particularly the French, such as Diderot and Rousseau, but also by such Englishmen as Locke, Berkeley, and Hume. Thus the belief that the mind of the human child is a *tabula rasa* on which anything can be incised was added to the fact that many of the founding fathers stemmed from Calvinistically oriented religious groups. This combination led not only to the belief that one can teach anything to anyone, but also to the tenet that one had a God-given responsibility to teach one's

fellow man. Education thus became a serious matter in early American life.

The second main influence on American education which I mentioned is geography. The United States up to very recent times — in some states up to the beginning of the 20th century — was a land of great expanses and small populations. The pioneer who moved as soon as he could see the smoke rising from the chimney of another settler, because he felt hemmed in by so much population, is a recurring theme in American literature. As Turner (1920) and many other historians have pointed out, the pioneer life calls upon each person to be a generalist instead of a specialist; with no one nearby to rely on, the pioneer must be carpenter, bricklayer, farmer, butcher, ironmonger, weaver, educator, millwright, physician, and a host of other things all by himself. His very existence depends upon his craftsmanship and his pragmatic knowledge; and it is not surprising, therefore, that the pioneer is likely to pay greater homage to knowledge of such a character than he does to what he calls somewhat contemptuously 'mere book-learning'.

Early American primary education took all of this into consideration. 'Book-learning' went through arithmetic 'to the rule of three' for farm accounting and planning; reading was confined to the Bible and later a weekly newspaper, as towns sprang up; and school let out at planting and harvesting time, so that the children could learn what they needed to do in 'real life'. Even college and university life mirrored these beliefs. Early colleges prepared men for the ministry mainly; but the Morrill Land Grant Act, which set up so many of the American state universities, was aimed at providing agricultural and mechanical arts training for an essentially pioneer and farming community. Even the earliest library schools, though attached to universities, were essentially vocational training classes, as Melvil Dewey pointed out over and over again to the ALA (Rayward, 1968).

It was against the background of this belief in the perfectability of every human being, the feeling of responsibility that education should be offered to all, and the high status of technical (compared to theoretical) knowledge that the MLA started and has continued its work in continuing education for its members, although I suspect that this will come as much of a surprise to some of the members of the Association as the knowledge that he had been speaking prose all his life came to Tartuffe's peasant! As might be expected, these beliefs are so much a part of our background that they are usually unperceived.

history

The earliest report of MLA's efforts recognized that many so-called medical librarians had no special training in librarianship at all; but implicit in it was the belief that they could all be taught whatever was essential. Let me read you the editorial which was published in the second volume of the Association's *Bulletin* in 1912, to give you some idea of what was to be taught and how it was viewed by the members of the Association, many of whom, I remind you, were physicians.

CLASS WORK FOR LIBRARY WORKERS

At the meeting of the Association at Atlantic City there was considerable discussion about library work and workers, and one suggestion was made concerning a certain amount of class work for beginners and even for older employees in medical libraries. It so happens that a great many of the smaller medical libraries are cared for by medical stenographers, or other persons untrained in library work. In order to acquaint such individuals with what is being done in the larger libraries it was suggested that a class be arranged each year at the time of the Annual Meeting, or sufficiently near it, so that those attending could also avail themselves of the opportunity offered by some of the larger libraries and advanced workers. The plan for next summer, if it is carried out, will consist in having several days at one of the larger libraries, when those attending will be taken in charge by one of the trained workers. The subjects of cataloging, binding, classification, general library management, care of journals, the use of library guides and methods for helping research workers could be taken up by those thoroughly familiar with the work. It would pay any small library to send their [sic] *librarian to such a conference, and the trained library workers would undoubtedly get much inspiration from contact with other workers and other methods. This would also help to keep the methods uniform in the various libraries and this is most desirable. We shall be pleased to hear in detail from our members and others interested in this work and trust that it can be satisfactorily arranged and properly advertised for sometime next year, and possibly even before should there be a sufficient demand for such a class.*

Unfortunately, it was not until 1958, some 46 years later, that this longed-for group of classes, held just before or just after the annual meetings of the Association, was finally to take form. But continuing education does not necessarily have to be in formal classes at set times, of course; and the record of the MLA in the use of other teaching forms is a long and honorable one.

I need not remind a group of librarians, I am sure, that the printing press allows for self-education which goes far beyond the confines of geography and time. Were this not so, all our collective efforts over all the years have been for nought, a pessimistic view to which I refuse to subscribe. The MLA has also believed in the efficacy of the printed word, and as a result has produced a number of useful printed teaching devices ever since its first days. The prime publication of the Association, of course, has been its *Bulletin*. Over the years there have appeared in its pages, cheek by jowl, articles of a general and of a technical, down-to-earth nature, such as discussions on classification schemes, a review of Library of Congress catalog cards by their progenitor, Mr. Martel, articles on the use of the telephone, the typewriter, the photostat machine, the Xerox copier, and the computer in medical librarianship, discussions and reviews of new books and journals, and on the care and feeding of library committees. Works on the history of libraries and the history of medicine have been published, as well as articles which examine what the goal of medical librarianship is and how libraries can best serve the groups for whom they are set up.

But the Association has not been content merely to publish its *Bulletin*. After many years of discussion, the first edition of the justly-famed *Handbook of Medical Library Practice* was ready for the printer in 1941. Based on a manuscript

by Miss M. Irene Jones, this first edition had a dozen or so authors contributing to it, and its scholarly yet common-sense approach mirrored well the outlook of its editor, Miss Janet Doe. The preface notes: '. . . this *Handbook* is both a manual of procedure and a reservoir of useful data. It is an attempt to imitate ontogeny by recapitulating in one volume the experience of the race of medical librarians' (Doe, 1943). Planned to help the medium-sized medical library (then defined as one of about 20,000 volumes), it was hoped that a companion volume to aid the smaller — almost the smallest — medical collection would be forthcoming. Alas, that was never to be, though a number of people struggled with it, and the American MLA has nothing to compare to the British Library Association Medical Section's aids for the small library or the recent (1967) work by Mrs. Beatrix Robinow, *Organization of Hospital Medical Libraries*, published by the Canadian Hospital Association.

Instead, after the second edition of the *Handbook* had been published and it was seen that a third edition would soon be a necessity, the Association decided to divide the contents of the original work into two parts, and to revise each at different intervals. As a result, the great tool *Medical Reference Works, 1679-1966; a Selected Bibliography* appeared in 1967 under the joint editorship of John Blake and Charles Roos of the NLM. Meanwhile, the third edition of the rest of the *Handbook* is now being readied for the press.

With the publication of still another tool for the education of its members, the *Development of Medical Bibliography* (Brodman, 1954), the MLA embarked on another kind of publication: the specialized monograph series. By the aid of a grant from the Eli Lilly pharmaceutical firm, the Association was able to found a publication series, of which two parts have so far appeared: the work just cited and the *Selected Papers of John Shaw Billings, compiled with a Life of Billings* by Frank Bradway Rogers, published in 1965. It is to be hoped that the success of these two works will attract other worthy manuscripts in a continuing series.

Still considering printed material, I should finally mention the publication of the Association's syllabi for its refresher courses and continuing education workshops, which allow someone unable to attend the course to learn something of the subject, and permit those in attendance to jot down and keep notes of what was said and done. Much of the effort for these stemmed from the work of Mr. Irwin Pizer. I should also point out that the Association's annual meetings have also been designed to continue the education of the members, as any reading of its programs will indicate.

All of these things show the continued concern of the Association for the education of medical librarians, and thus indirectly for the greater usefulness of the institution of medical librarianship. Although over the years there have been a few who complained that the material presented, the articles in the *Bulletin*, the refresher courses, and the concerns of the Association's committees have been directed more at the needs of the larger libraries than the smaller ones, a reading of the record shows that this has not been so at any time in the history of the Association. Again this is a reflection of the American point of view on the upward mobility of all educated people: the theory that if you teach a person more, he will be able to take on greater responsibility, and since he is able to take on that responsibility, he will be given it.

Finally now, I should like to discuss the work which the MLA has been engaged

in which can more narrowly be described as 'continuing education'. Part of this will be discussed by Mr. Watterson (this volume, p. 308), and I do not wish to steal any of his thunder. But since, in a manner of speaking, I can be described as 'the oldest living inhabitant' of the recent surge of the Association's work in this field, perhaps it will be forgiven me if I reminisce a bit, in true old gaffer style.

There have been two paths by which the Association has attempted to aid in medical library education: one in conjunction with formal, academic study, and the other by presenting less tightly organized short courses in various subjects in medical librarianship which might need reinforcement or might just be developing at the moment. In the field of formal study, beginning with the pioneer work of Miss Mary Louise Marshall soon after World War II, the Association has worked with library schools in developing courses specialized in the work of medical librarianship, and has backed up approval or disapproval of such courses by certifying the graduates of the classes it approves. At this point in time, some dozen such classes are being offered in the U.S.A., ranging from intensive 6- or 8-week summer courses to whole-year integrated curricula in general and medical topics.

As an extension of this principle, the Association has also set standards and furnished approval for those specialized work-study periods (generally called internships or traineeships) which occur after the formal training and are meant to give the neophyte the chance to apply in actual practice what he has learned in theory. About half a dozen of these now exist, in a variety of places from the NLM to hospital libraries. Most of them are now financially underwritten by the U.S. Public Health Service. The first five-year grant period for these traineeships is now drawing to a close, and it will be interesting to see how they are evaluated by those with the purse-strings, and who are therefore in a position to make further grants for the program, should they consider it a worthwhile expense.

As I mentioned earlier, it took some 46 years from the first formal proposal that classes on medical librarianship be held in conjunction with the Association's meetings until the proposal was put into effect. Under the leadership of Mrs. Mildred Langner, an experimental series of quarter-day refresher courses was begun at the 1958 meeting of the Association at the Mayo Clinic in Rochester, Minn. In this system it was possible for students to attend two sessions in the morning and two sessions in the afternoon on different subjects. The topics discussed included such things as rare books, bibliography, cataloging, reference work, and the like. The instructors were members of the Association chosen for their special knowledge, but what they presented and how was left entirely to their discretion. As might be expected, some instructors turned out to be excellent teachers with well-planned, logical presentations; others were not. Some classes were lectures or monologs, others were discussions, and still others worked set problems co-operatively. One objection voiced was that the students in each group were so diverse in background and experience that it became difficult to present material useful to everyone. The main complaint, however, had to do with the frenetic quality of the day: the attempt to crowd too much in too short a time.

In order to do away with these difficulties, the Association tried two innovations. At one meeting it divided the students into groups by size of the library in which they

worked, in order to give homogeneity to the classes, and it assigned instructors who came from the same general size of library as the students. At another time the Association obtained a subvention from the National Institutes of Health for a one-week institute in medical library administration, which was held at the University of Illinois Medical School Library with Miss Wilma Troxel in charge. Here students were paid for their living expenses and tuition, and the instructors (librarians, physicians, specialists in budgeting, psychology, audiovisual aids, and the like) were suitably reimbursed. Students worked in teams on problems they chose, on which they reported to the entire group at the end of the week.

Although these things were a great advance, they did not completely do away with the problems inherent in the system, so in 1962 Dr. Frank B. Rogers, the President of the Association then, appointed a committee to study the problem and come up with wide-ranging suggestions. The committee spent a year deliberating, studying the experience of other groups, and trying to devise a system which might be a reasonable answer to the questions posed. The results of the committee's deliberations were published in the *Bulletin*, as a possible guide for future groups interested in the same question.

One of the proposals made was for a series of graded courses to be taken over a number of years; another was for standardization of what was taught; a third was for a peripatetic 'school', brought directly to the local area and the younger staff member, who often could not come to the Association's annual meeting. All of these suggestions have been accepted and implemented to a degree, with several hundred people each year being enrolled in the courses. The development in further detail of these principles, and the reappraisal which the Association felt it should make of the entire program a few years ago (with its unexpected result of an entirely new investigation of the whole subject), are the themes of Mr. Watterson's paper, and I do not propose to encroach on his domain. In my opinion, however, it is a sign of the vitality both of the idea of such continuing education that it is not accepted passively as that which was always so and will always continue to be so, and of the maturity of the MLA that in the midst of an apparently extremely successful program it should pause to take stock and try to determine where next it should assay an effort. The dissatisfied mind and the willingness and ability to ask searching questions and to think deeply ought, of course, to be the hallmark of a group which unites scholarship and pragmatism within it.

conclusion

Let me now conclude. There are two theories of education. George Gissing (1903) represents the pessimistic view when he says in the *Private Papers of Henry Ryecroft* that 'Education is a thing of which only the few are capable; teach as you will only a small percentage will profit by your most zealous energy'. While we might all of us subscribe to this view after a particularly difficult time trying to knock some sense into a senseless student, the American generally takes a more optimistic view. It is his belief that everyone can be taught and that everyone should be taught. But to an American, I fear, education is often the means to the end, not the end of joy-in-knowledge. The average American, I am saddened to have to report, agrees with Thomas Henry

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VI

the medical library association's current program in continuing education

R. M. Watterson

Dr. Estelle Brodman (this volume, p. 301) has spoken to you concerning the underlying philosophy of the Medical Library Association's concepts of continuing education. The idea of continued learning or greater understanding of one's particular profession is an idea embraced by many professional organizations. The MLA is not concerned solely with its professional members but is equally concerned with ancillary library personnel. The history of its efforts has been traced; the concern of individual members, and collectively the Association, for furthering continuing education has been shown. I will not reiterate what has been done prior to 1962, but I will try to illuminate the past seven years of the Committee on Continuing Education and the Association's efforts to achieve leadership in education in its own professional area.

In 1962 Dr. Frank B. Rogers appointed Dr. Brodman as Chairman of a newly formed Committee on Continuing Education. This indeed was a wise and far reaching appointment. Dr. Brodman was and is deeply concerned with the problem of educating medical librarians. Other members of that original Committee included Miss Betty Ann Withrow, Miss Margaret Kinney, Mr. Erich Meyerhoff, and Mr. Harold Bloomquist. As already pointed out, one product of this Committee's efforts was a series of background papers on the problems and efforts of other professional groups also concerned with the continuing education of its members. Conclusions were drawn by the Committee, and recommendations were presented to the Board of Directors of the MLA (Brodman *et al.*, 1963). They included the following specific recommendations:

1. A three-year plan of action be approved by the Executive Board to begin in 1964.
2. In the first year, a return should be made to the presentation of the same body of knowledge at two levels — theoretical, basic aspects in one, and practical task orientation in the other — and members should be allowed to choose whichever they feel accords with their real interests. The subject of this series should be machine methods in libraries. The method should be repeated for two or three years, though the subjects encompassed should vary.
3. The second year of the plan should see a continuation of the method outlined in 2 above, plus a one- or two-week institute held at a library school or university along the lines of the 1962 University of Illinois Institute and funded by a grant from a governmental or other body interested in raising the level of the practice of medical librarianship.
4. In the third year, a team of experts should be offered to local MLA groups for presentation of continuing educational opportunities near the libraries involved, thus allowing individuals who are unable to come to national meetings to participate. Some thought should be given here to education for those who are working in medical libraries without formal library school training, for they are more likely to attend local rather than national meetings.
5. In order to differentiate clearly in the minds of both the leaders and the students

the Association's Annual Meeting and its refresher courses, and to present a real choice to students of taking these educational offerings or not, the Committee recommends that the courses be presented at either the beginning or end of the meeting, not during it.

These recommendations have been fulfilled; perhaps not in the three-year time limit or in the order stated, but fulfilled nonetheless.

The first presentation of courses was offered in San Francisco in 1964. Two courses were offered: CE-1, Basic Punched Card Principles for Librarians, and CE-2, Implications of Machines in Libraries — Social, Economic and Administrative. The enrollment at that time should have heralded the future. The enrollment for CE-1 was 120 and for CE-2, 50 Comments after the meeting, both to instructors and to Committee members, showed that this type of educational activity could be successful.

The Committee decided to expand the course offerings and to add additional Committee members to its rolls. It was decided that whenever possible a workshop type of presentation would be incorporated into a course. The idea of being able to handle and use tools or machinery first described during a lecture period would be of more value to the participating members than a straight lecture. New courses were developed and plans were made to offer them as soon as feasible. It was decided that the one-day courses offered at the National Meetings would be presented in cyclic fashion, one course building on the foundation of previous courses. The Committee tried to develop courses designed to broaden the background of individuals and to introduce new tools and concepts which would enlighten medical librarians to new trends in the profession. A catalog of courses to be offered in the future was developed. It was quite easy for the Committee to agree that certain courses should be offered for the good of the membership, but it was another thing to get these courses written and implemented. One method employed was that new members appointed to the Committee were required to write the syllabus for a particular course.

As the offerings of courses increased, so did the enrollment; with the increase in enrollment, the amount of labor expended by the Committee rose. In 1965 at the National Meeting held in Philadelphia, the Committee agreed to present three courses, two of which were offered for the first time: CE-3, Techniques of Systems Analysis and Design, and CE-4, New Reference Tools and Their Use; in addition, CE-1 was offered again.

It is extremely difficult to explain the logistics of presenting these courses. CE-1, Basic Punched Card Principles for Librarians, involved the students with the use of a keypunch machine. This entailed bussing these participants to the local IBM facility to use their machines. It allowed the students to work out a program utilizing punched cards, run the cards through a printer, and allowed the students to see the results. It was felt to be essential that in all phases the student must be involved. Boards had to be wired for the printing machine, students bussed, lunches arranged, and students returned to their original location. All this was being done simultaneously with the offering of two other courses. The Systems Analysis course could be accommodated at the hotel and had a limited number of necessary tools.

The New Reference Tools course posed a completely different problem. It was decided that while CE-4 would be presented by utilizing the lecture method, there would also have to be a workshop so that students could actually work out predetermined questions. Five major medical reference tools were included. Arrangements were made with publishers for particular issues of their publications in order that students could actually handle these tools. This course was given at the Drexel Institute of Technology. The Committee was able to make all necessary arrangements by mail and telephone. However, Committee members were not quite prepared for the actual bulk of material it had agreed to contend with. When arriving at Drexel and faced with the sheer magnitude of tools, the first quickenings of apprehension were felt.

The Committee, as all committees do, coped. However, at this point many factors were in its favor. This particular facility was in a university, and there were regular classrooms, rather than makeshift hotel rooms, so even though there were problems of physically moving materials, they could be solved. Again, the presentations of the Committee were successful. The participants seemed to find the courses offered worthwhile; the instructors felt that the participants were learning about new tools and about new features of older tools. The entire concept of continuing education was re-enforced, and the Committee was pleased that it was able to contribute. In this state of euphoria, the Committee forgot the problems of bussing, of moving mountains of reference tools, of students who wanted to change courses at the last moment, and the other myriad objections faced prior to the successful completion of the course offering. On went the program, and on went additional courses and plans for even more.

The next national meeting was scheduled for Boston in 1966. Plans were made to offer five courses. CE-5, Human Factors in Medical Library Administration, was offered for the first time. The entire group of participants met together for one segment of the course prior to breaking up into smaller groups. One problem was to arrange a room where 55 people could gather for a lecture, then split into 4 sections to continue their course, then regather to recap the day's sessions.

Meanwhile, the problems imposed by CE-4 and the avalanche of reference tools were unimaginable. Prior to the meeting, the Chairman had arranged for the publishers of the various tools used to provide six complete sets of needed tools. It was recognized in Philadelphia that commercial movers were required to move the mass of materials before and after this particular course, but the problems of hotels were not reckoned with. The particular rooms used for teaching purposes were also to be used that evening for other functions of the Association. This allowed two hours to clear the rooms and for hotel personnel to set up for the evening functions. Due to the press of time and the necessity to save these particular tools, it was decided to move them to the Countway Library at Harvard and to sort them the following morning. The following morning the entire Committee met and went to work sorting out reference material. It was decided to package these materials in six sets in order to facilitate mailings for the regional offerings of the Committee.

It was hoped that regional programs could be offered for those persons who could not attend the National Meetings of the Association. One of the purposes was also to offer the program to non-professional members of library staffs. The first of these

regional offerings was given in Minneapolis in October of 1965 in conjunction with the University of Minnesota Library School's Institute on Information Retrieval. Two courses were offered to an enrollment of 28 persons. In February of 1966 the second regional program was given in New York City. This was the start of a concept which was soon to spread to other regional groups of the MLA.

New syllabi were being added to cover the curriculum set up by the Committee. Some of these courses needed only an instructor and syllabus; arrangements for their presentation were relatively simple. One had only to arrange to bring instructor and student and syllabus together anywhere in the country. However, those courses which required special equipment, such as Basic Punched Card Principles for Librarians, or special tools such as those used in New Reference Tools, posed greater problems. The Committee now had a library of reference material donated by various publishing companies. These materials had to be stored and sent out to regions who wished to present a particular course. Several regional meetings are held in the fall, and the logistics of not just getting instructor and student together, but the additional problem of having reference tools there at the same time was encountered. Materials were being sent around the country by a variety of methods: trucking companies, rail, and, on several occasions, by private auto. As the course offerings grew, so did the requests for regional presentations.

At the National Meeting held in Miami in 1967 the Committee offered five courses, two of which were given for the first time. Again there was a recurrence of the problems of shipping tools and using space not designed for teaching purposes. An additional problem was encountered: a torrential rainfall that flooded the lower level of the hotel and started Committee members hurrying to save borrowed reference materials. Some of the Association's most illustrious members removed their shoes and waded into the waters in an effort to assist Committee members. Even after this latest adventure, the Committee felt that it should attempt to fulfill another portion of the original recommendations. Perhaps it was the sun after rainfall or perhaps the influence of the tides, but the Committee became eager to provide a week-long institute. A proposed budget was drafted, the week's activities outlined, and the Committee was in complete agreement as to what was to be covered. The Chairman of the Committee, along with other members, met with Dr. Rogers to apprise him of the plans. Dr. Rogers was to host the 67th Annual Meeting of the Association, and his endorsement and help for the institute plans were needed. Dr. Rogers offered his assistance. Since decisions of this magnitude cannot be made in the name of the Association by a Committee, it was necessary to get the approval of the Board of Directors. Their consent was given, and plans for a self-supported Continuing Education Institute for Health Science Librarians were underway.

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syllabi, three new courses were to be offered. The Committee had long since stopped mimeographing their own syllabi and were having them printed. The chore of seeing eleven syllabi through the printing cycle and maintaining schedules for drafts of new syllabi was a chore in itself. The syllabi were printed by the Harvard University Printing Office and were ready in Denver when they were needed. Dr. Rogers appoint-

ed Mr. Ned Eig as the Denver liaison with the Committee on Continuing Education. This was, as far as the Committee was concerned, a fortunate choice. Both men visited possible sites where an institute could be held. Registration was limited to a maximum of 150 persons. The fee for the institute was to include tuition, room, and board. With these prerequisites a decision was reached, and Temple Buell College agreed to provide the necessary space so that all functions of the institute could take place on its campus. The Committee believed that as many educational opportunities as possible should be offered. Registrants could select five out of ten offered courses. These day-long courses could now be taken in the originally intended cyclic fashion during the week's session.

The setting was ideal: no longer were instructors teaching in cramped hotel quarters, but had actual classrooms. There was ample space to spread reference tools and more time for student faculty interplay. The students, faculty, and Committee members were able to discuss problems with each other throughout the day. In addition, evening programs were scheduled, featuring outstanding medical librarians speaking on a variety of subjects. These sessions were held in a small theater on the campus. Evening speakers included Dr. Brodman, Miss Gertrude Annan, Miss Helen Yast, Miss Louise Darling, Dr. Rogers, and Mr. Philip Wade. Certificates of Attendance were distributed to the registrants on the last day of classes.

Following the Institute all materials were moved to downtown Denver. The next Monday found the Committee again preparing to offer seven courses at the one-day National Meeting. At this time another new course was offered.

Regional and National presentations are still being enthusiastically sought. The following is a listing of courses available:

CE- 1, Basic Punched Card Principles for Librarians
CE- 2, Implications of Machines in Libraries — Social, Economic, and Administrative
CE- 3, Techniques of Systems Analysis and Design
CE- 4, Selected Biomedical Reference Tools
CE- 5, Human Factors in Medical Library Administration
CE- 6, Computers and Programming — An Introduction
CE- 7, Quantitative Measures as Management Tools
CE- 8, A Review of the Literature of Dentistry
CE- 9, Materials for the History of Medicine
CE-10, Recent Advances in the Literature of Pharmacy
CE-11, Techniques of Interlibrary Lending

The continuing education program has always aimed to be self-supporting. Originally the cost of a course was set at $10. After local programs were offered, the shipping of materials and the printing of syllabi increased costs, and the registration fee for courses had to be increased to $15. The Institute charge was set at $150, and as previously mentioned, it covered the participation in five courses, room, and board.

Instructors for teaching have been selected from the membership of the Association whenever possible. When the Committee felt that additional skills or knowledge were needed for a particular syllabus, they did not hesitate to seek expert advice

from persons outside of the Association. Regional instructors were chosen from *within the sponsoring region. The one stipulation that the Committee imposed* was that regional instructors should also have taught at the national level. This was done to insure uniformity in the program. Instructors for the national presentations were always present for a run-through of the syllabus on the day prior to teaching. This usually was a Sunday, as courses were usually offered on the Monday of the week of the meeting. Honorarium for faculty teaching at the National Meetings is $60.

While self-supporting, the cost of the program grew. Many costs were of a hidden nature and were not charged to the Association: housing of materials, packing and unpacking reference tools, etc. Also, the growing amount of time that each Committee member had to spend to plan programs was increasing. The Committee finally felt that it must try to make other arrangements for the administration and continuation of the program. A grant request was submitted to the National Library of Medicine early in 1966. It was hoped that funds might be available under the Medical Library Assistance Act to support and expand the Association's program. The NLM required that a recipient of grant monies be an institution, so a joint proposal was submitted by the State University of New York Upstate Medical Center and the MLA. Unfortunately, this request was not approved. This left the Committee with the problem of rapid growth and expansion without the necessary financial means to implement the program.

Late in 1966 the President of the Association appointed an *ad hoc* committee to study the problem of continuing education in medical librarianship as suggested by the NLM. After much consideration, the committee agreed: 'that an effort be made to collect qualitative and quantitative information concerning the need for continuing education programs for medical librarians, and that a planning study research grant application be submitted to the National Library of Medicine with the Medical Library Association as sponsor' (Brandon, 1967). This Committee also suggested the names of the investigators and of an advisory council which would represent the MLA. Dr. David A. Kronick and Professor Alan M. Rees, who were named as the investigators, submitted a proposal to the NLM for a one-year study. This time the grant request was approved and funded.

Joint investigation of the manpower pool, its educational needs, and other pertinent statistical data pertaining to medical librarianship are now being compiled by the AMA, the AHA, and the MLA. The original one-year grant request has been extended, and soon information concerning the goals and type of education, basic and continuing, will be available. From this statistical data base, the Committee on Continuing Education will be able to indentify needs and areas in which it can make its program more beneficial.

For a statistical summation of the efforts of the Committee, I would like to enumerate the number of courses taken by individuals to date:

1964	198
1965	250
1966	530
1967	328
1968	788

In the fall of 1968 there were two regional presentations teaching an additional 42, making a total of 2,136.

The success of this program can be attributed to several factors. First, the Association's recognition that it should be actively involved in the educational needs of its members. Secondly, that the membership has embraced the concept of continuing education as one method of enriching itself. The last factor is that all members of the Committee have strived and worked over the last years toward the original goals. Without their efforts and contributions, the program would not be the success that it is.

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veterans administration library service education programs, with some additional remarks on the programs of the american hospital association

H.J. Gartland

For the most part, I shall be speaking about the continuing education programs for medical librarians serving in hospitals of the U.S. Veterans Administration. It is my purpose to share with you some of our experiences in developing these programs to meet the needs of the VA during the period of the past 20 years.

Before coming to the substantive aspects of my subject I feel that it would be useful to provide background information about the VA. Beginning as far back as the American Revolution (1775-1784), veterans' benefits have been granted to men and women who have served in the U.S. armed forces. There have been a number of agencies of the U.S. Government responsible for the administration of federal laws relating to veterans and their dependents. The present VA was created in 1930 and it assumed all activities concerning veterans. The U.S. Congress appropriates in excess of six billion dollars annually for benefits to veterans and their dependents, and for the administration of these programs. It is the fourth largest item in the budget of the U.S. Government. Most of this appropriation, $4.5 billion annually, is paid in compensation and pension and death benefits to 5.1 million recipients. Since benefits for veterans also extend to their dependents, almost one-half of the total population of the U.S.A. is directly affected by the VA's activities. Over 94 million persons are listed as veterans and dependents.

The VA functions through three departments. The Department of Veterans Benefits administers compensation, pension, insurance, loans for education, home-buying, assistance to dependents and related benefits. The Department of Medicine and Surgery is responsible for all medical benefits. The Department of Data Management provides computer and other forms of electronic data processing support for the two operating departments.

For our purposes we shall be primarily concerned with the Department of Medicine and Surgery. Throughout this paper you will observe the interaction between the forces which influenced this Department's policies and the medical library program's responses. It may be useful for some in this audience to place their own library programs in the historical perspective of the VA's experience and then to make suitable adjustments as a basis for their own progress. The Department of Medicine and Surgery is responsible for a network of 166 hospitals, all with outpatient services, distributed throughout the country, and under a unified administration. Each hospital is required to maintain a medical library to meet the needs of the particular hospital. Also, it is a policy requirement that the library program be under the direction of an academically qualified librarian. The VA hospital system is composed primarily of large hospitals with all medical services represented, except those relating to children. These hospitals with their 115,782-bed capacity constitute 7% of all hospital

beds in the U.S.A. The VA is the largest single employer of health personnel in the country, employing approximately 135,000 persons, including more than 5,000 physicians, 700 dentists, and 15,000 nurses. It is the largest clinical system for training, with large numbers of personnel involved in teaching activities. Almost 2,400 VA hospital staff, which includes 1,846 physicians, hold faculty appointments in medical schools, dental schools, professional schools, universities and colleges. Each year close to one-half of the graduating physicians in the nation receive a portion of their training in VA hospitals.

I have divided my remarks into three phases. The post-World War II period, 1946-1956, will provide the foundations of the Library Service and the early beginnings of training in medical librarianship. The period 1956-1966 will show new situations in the Library Service and will provide examples of the training base decided upon at that time. The third time frame, 1966 to date, will examine new forces of change for the VA and some of the newer educational responses of the Library Service to support the agency's medical objectives.

1946-1956: the foundations

This was a decade of expansion in all aspects of VA activities. The ending of hostilities, the speeding up of demobilization, and the granting of additional benefits all combined to throw an unprecedented workload upon the VA. On June 30, 1946, the VA was operating 109 hospitals, an increase of 12 over the total of 97 in operation on the same date in 1945. On June 30, 1956, the VA was operating 174 hospitals with 121,204-bed capacity as contrasted with 86,000 of 1946. In addition to expanding the physical facilities for the medical care of the veteran, a number of significant administrative actions were taken. The first of these was the passage of P.L.79-293, January 3, 1946. This law established the Department of Medicine and Surgery with authority to provide all functions 'necessary for a complete medical and hospital service'. It also removed the appointment of VA physicians from civil service laws, because that system could not attract enough top-rated professionals to the big task required in veterans' medicine.

Of paramount importance to the future course of VA medicine was the provision in this law that authorized 'the establishment of residencies, the condition of employment, including necessary training, and the amount of pay during the period of employment and training'. The VA immediately began implementation of this aspect of the law by instituting a plan for the affiliation of its hospitals with the nation's medical schools. Magnuson (1946) in his report to the Council on Medical Education and Hospitals of the AMA provides us with a summary of the plan. Basically, the plan proposed that medicine be practiced in VA hospitals as it was practiced in the university hospital, and that medical education was to be so co-ordinated that the VA hospital would become a postgraduate teaching unit of the university hospital group. Four months after the plan was announced (May 1946), 50 medical schools had agreed to co-operate. This affected 76 of the VA hospitals which were sufficiently close to the medical schools to allow for this application.

This was the background and setting for the VA Library Service. The Depart-

ment of Medicine and Surgery was beginning to raise the quality of veterans' medicine through association with the nation's medical schools. At the same time it was confronted with unprecedented demands for the medical care and treatment of the newly returned serviceman. There had been in the VA since 1923 a library service to patients. To this basic program had been added some concepts of service to the medical staff but this was a service largely unorganized and of secondary consideration. Beadles (1947) in her address to the MLA Annual Meeting at Cleveland gives a summary of medical library conditions in the VA hospitals located in Maryland, Virginia, West Virginia, North Carolina, and the District of Columbia. She observed that static book collections were out of date, poorly classified and cataloged collections were scattered throughout the hospital, that there was no policy regarding loans, and that current materials were charged out indefinitely. Nearby resources for interlibrary loan were used by only two hospitals. In the entire area there was only one complete set of the *Quarterly Cumulative Index Medicus*. Several hospitals had incomplete sets, and there were no other bibliographic indexes. Beadles correctly identified the two major needs of the VA Medical Library Service of July 1946 as, first, the employment of medical librarians and, second, the supplying of necessary books and journals for the use of clinical staff and residency training.

The man selected to move the VA Library Service into direct support of the expanding medical requirements was Francis R St. John who was appointed Director of Library Service, January 1947. Kerr (1947) described the scope of the program and St. John's responsibilities in the *Library Journal* under the caption, 'Reorganization of the Veterans Administration Library System Guarantees Greater Service to Doctors and Patients'.

Librarians were coming into the VA library system. Baatz (1949) reported that in June 1944 there were 141 librarians as contrasted with 473 on duty in 1947. For the most part the new personnel were qualified librarians who had served in the various branches of the military. Unfortunately, the vast majority lacked either hospital or medical library experience. In-service training was needed throughout the system and it was needed immediately. St. John (1947) decided on two approaches. First, he needed to create an understanding of VA and the relationship of the Library Service to the agency's total mission. The general training required for this objective was conducted at three-day library institutes in five cities throughout the country. The institutes stressed service to the medical staff for reference, research, and training. Included also in the institutes were discussions of those matters which contribute to service: the organization of library service, the functions of library service at each organizational level of VA, the content of services, as well as the usual subjects of publicity, budget, procurement, cataloging, and book selection. Every chief librarian attended one of these institutes. His second approach to the education of the VA librarians was to provide technical training in medical librarianship. These plans culminated in 1949 when the VA sponsored courses at the University of Southern California, University of Chicago, University of Illinois, and Columbia University.

Perhaps the single most important educational program of the VA Library Service during this period was the result of this VA-university co-operation. The schools selected were in proximity to important VA hospitals, represented a geo-

Table I. *Curriculum outline.*

Monday	Tuesday	Wednesday	Thursday	Friday
		First week		
Introduction	General tools in medicine	Methods of reference work		
Objectives	Dictionaries			
	Directories	Introduction to kinds of medical literature	Anatomy	Physiology
Hospital organization	*Surgeon General*			
	Index Medicus			
Place of library in hospital	*Current List*			
	Excerpta Medica			
Intra-hospital relations				
Tour of the library				
		Second week		
Bacteriology	Biochemistry	Pathology	Medicine	Medicine
		Third week		
Surgery and Anesthesiology	Surgery	Radiology and Radioisotopes	Neurology and Psychiatry	Final examination
History of medicine Medical terminology Selection and weeding	to be taught as an integral part of each subject			

graphical spread, had an interest in VA training, and could provide accredited library school instruction. The need for such training was well known and accepted at the highest levels of the VA. The difficult part of the program was in the actual preparation and development of a specific curriculum which would provide VA librarians with such training necessary to make them most useful to the agency's medical needs. Mohrhardt (1951) has told how the VA proceeded to solve the problem and how the courses were constructed. The most extensive comparable program, the Medical Library Training Course at Columbia University, was examined in detail and provided information used in the development of the new course. Specific guidelines and limitations were early established in order to control as nearly as possible the variations to be considered in the program. The basic elements which guided the planners were: instruction was to be given in the general backgrounds of various medical subjects, as well as the tools and techniques of medical library reference work; the medical subject matter would be given by physicians; and only those subjects would be covered which would be of anticipated usefulness to those engaged in VA library work.

As a result of conferences with concerned officials of the universities and the VA, a general curriculum was developed (Table I) to be used by the co-operating institutions providing the instruction. In general, the pattern was to have, first, a discussion of a specific phase of medicine by the physician. This included a brief history of the subject, a general discussion, and current research. This was followed by instruction in the bibliographic and reference tools available for library research in this field. There were minor variations in the general plan adopted at the various

institutions. Each of the courses covered three full weeks of academic work and carried three semester credits at the graduate level for those who could qualify for graduate work. Twenty VA librarians were selected for each course. Overall continuity of supervision was provided by a member of the VA Headquarters staff.

The librarians attending the courses were selected to go to a particular university because of geographic proximity, thus keeping travel costs at a minimum. Two recommendations were made at that time which may also be useful to those planning similar courses today. First, background and experience rather than geographic location should be a criterion for selecting the student body. Second, for students attending the course without prior education or experience in medical librarianship, preliminary background instruction and information should be given prior to actual attendance at the university. During 1950 it was possible to support only one course, which was held at the University of Illinois Medical School in Chicago.

During the period 1946-1949 the VA was administratively organized in three levels of management. The Headquarters in Washington, D.C., prepared and issued policy directives to an intermediate level called Branch Offices. The country was divided into 13 Branch Office areas, each of which contained a number of hospitals. The Branch Offices supervised the hospitals within their respective areas and were responsible for monitoring the timely and appropriate implementation of policy by the third organizational level, namely, the local hospital management staff. During this period each Branch Office staff included a chief librarian and an assistant chief. These librarians received the many separate directives of policy coming from the Washington office of the Library Service and were the responsible agents for the Library Service in their areas. Their principal function was to supervise the hospital library program. Through their visits to the hospitals they were able to transfer ideas and practices between the hospitals. They also arranged for intra-VA assignment of librarians from one hospital to another in order to provide a training base through cross-comparison of programs. Another aspect of the Branch Office librarian's activity was the conduct of conferences of librarians at the Branch Office level. These conferences usually reflected concern with procedures. Frequently, speakers from the library community in the area were on the agenda of the conferences.

Cohesion and uniformity of practice and procedure was brought to the VA Library Service in May 1951 with the issuance of VA Manual M6-5, *Library Service*. This publication was the bible for all librarians at all organizational levels. It brought together the many separate letters of instruction and by so doing provided a common reference service. Among other provisions, the manual assigned specific training responsibilities to the hospital chief librarian. To assist, the Headquarters Library Service issued a pamphlet, *On-the-Job Training Program — Hospital Librarian*. The training program topics included: organization of the VA; Library Service organization and functions; administration of hospital libraries; selection of materials; readers services; and interlibrary loan. The basic text for the training was the Library Service manual. Uniform practice, standard forms, central cataloging and procurement, all converged in the manual and provided the basis for building a library system within the VA. The library system did not come to the VA through any magic. It came as a result of the vision and understanding of the program's early leadership. The

potential of the system was not realized in the decade 1946-1956; in fact, the full potential is yet to be realized, as will be seen later in this paper. I would refer those interested in reading further about the programs during the period to my article (1957) on the subject.

1956-1966: the transition

The close correlation between expansion of VA medicine and its supporting medical library service, established in the 1946-1956 decade, continued into the next. In 1956 there were 2,300 medical residents and 1,900 paramedical trainees in the VA system. In 1966 there were 3,300 medical residents and 3,800 paramedical trainees, an increase of 43% for medical residents and 100% for paramedical trainees. During the same period the number of research projects increased from 3,600 in 1956 to 6,500 in 1966, an increase of 81%.

A number of different approaches were taken to meet the requirements for in-service training which expanding medical activities necessitated. Some of these were carry-over programs from the earlier period. For example, during the 1956-1966 period the practice of regional conferences was continued. These conferences reflected a concern with the administrative aspects of the growing library system. In 1956 the average librarian had 10 years of VA experience. To bring technical competence up to date and to provide exposure to large special libraries and their practices, it was again decided to hold institutes outside the system. Refresher courses of five-day duration were held at the following locations:

Tulane University	November 1957	Mary Louise Marshall
National Library of Medicine	June 1958	Mary Louise Marshall
New York Academy of Medicine	February 1959	Mary Louise Marshall
University of Kansas	November 1959	William D. Postell
University of Southern California	January 1961	Vilma Proctor
Cleveland Medical Library	January 1962	David A. Kronick
University of Minnesota	June 1962	William D. Postell
Mecklenburg County (Charlotte, N.Car.) Medical Society	June 1962	Helen Monohan

The course outlines were prepared by the individual instructor. The VA provided general guidance for each course with the request that reference tools in the areas of medicine, surgery, neurology, and psychiatry be stressed. Periodical reference assignments and bibliographic projects were included as part of each course. During the 1956-1966 period a total of 185 VA librarians attended courses in medical librarianship at library schools or in conjunction with professional association meetings. In these instances VA paid tuition, travel, and *per diem* costs, either completely or partially.

Training materials in the form of Program Guides and Library Service Newsletters were issued from the Headquarters of the Library Service for the continuing education of the hospital librarians. The program guides were keyed to the policy manual and provided operational data and guidance. For example, they described the types, costs, and evaluations of microfilm readers, how to compute medical library space requirements, and methods of gauging program effectiveness. The Library Service News-

letters went to all librarians in the system and contained information concerning practices in designated hospitals. The librarian wanting more data on a particular practice was encouraged to correspond with the originating hospital.

Two other programs of training are worthy of mention as having their inception at this time, the Work-Study Program of 1959 and the Career Development Program of 1964. Both of these are described in my article (1965) and I shall refer to them later in this paper. In summary of this period, I would identify it as one of transition from the earlier beginnings to a strengthened and refined medical library system. Its primary support was, and is, a qualified, educated, and experienced corps of medical librarians, 90% of whom were college graduates and whose average length of VA service was approximately 20 years. Earlier, I referred to the interaction between the Department's policies and the medical library responses. Necessity for such interaction has become increasingly imperative during the past few years. Decisions taken now will provide the basis for the continuing education of VA librarians in the immediate present and most likely during the decade of the 1970s. As the VA mission changes, so too must the education of its supporting library staff.

1966-: the present and beyond

The Subcommittee on Facilities of the President's Commission on Heart Disease, Cancer, and Stroke (1965) commended the VA's leadership role in health manpower education and training, but also made the observation that 'here too, however, is a vast resource being incompletely utilized'. Increased utilization of VA hospitals is now being effected through the enabling legislation of P.L. 89-785 (November 7, 1966), the Veterans Hospitalization and Medical Services Modernization Amendments of 1966. This legislation requires the VA to assist in training for the nation's health manpower needs, to share its facilities, and to exchange medical information with hospitals, research centers, medical schools, and nonprofit institutions. VA Chief Medical Director Engle (1968) has indicated that a long-range objective of the VA is to increase its current training program of 29,000 professionals and allied health personnel to 81,000 by 1973. The impact of these projections may well have caused *Medical World News* (1968) to describe the VA hospitals as a major resource for education and training.

Concurrently, other federal legislation is having an impact on VA hospitals. Specifically, P.L.89-239 (October 6, 1965), Heart Disease, Cancer, and Stroke Amendments of 1965, is perhaps the most significant. A provision of P.L.89-785 requires that VA programs, to the extent practical, be co-ordinated with those of the Heart Disease, Cancer, and Stroke Programs which are now functioning in 57 regional medical programs (RMP) throughout the country. VA hospitals are now listed as significant resources in 47 of these. It is not necessary for me to detail here the correlation between P.L.89-291, Medical Library Assistance Act of 1965, the various intramural programs of the NLM, and the VA Library Service. It is self-evident that VA relationships between NLM grantees for the training of medical librarians and regional medical libraries particularly must be established and maintained.
with the decentralized search centers of MEDLARS, co-ordination is

What then is the significance of these events in terms of current and projected training of VA librarians? The significance is primarily one of exposure to new concepts. Whereas up to this time VA education for librarianship has been predicated upon meeting internal needs through a technically competent staff, the new requirements necessitate, in addition, an ability to look beyond VA needs and participate in the solution of national biomedical communications problems.

In 1965 the VA Library Service changed the format of its basic educational tool, the conference of chief librarians. Where previously such conferences were on a regional basis, the new format brought librarians from all over the country to Washington for a national conference. The reasons for this were two-fold: to develop a consciousness of belonging to a national system, and to utilize an agenda for presentation of national topics by prominent VA and non-VA speakers. These conferences have been held in Washington, D.C., and will continue at least until all chief librarians have an opportunity to attend. The proceedings of such conferences are sent to the directors and chief librarians of all hospitals in the VA system. The direction of educational emphasis is displayed in the agenda of the conferences.

Conference themes vary from year to year and agenda are prepared which reflect current needs and interests. The first such conference in 1965 dealt with in-house forces that placed demands on libraries such as research and education services, and the extent of support available which brought into focus the budget process and use of interlibrary loan resources such as NLM. In 1966 new concepts in physical facilities (learning resource centers) and new directions in medicine were in the forefront. Two conferences were held in 1968, one in the spring and one in the fall. The first covered programs outside the VA which influenced VA library services: COSATI (Committee on Scientific and Technical Information), Library of Congress MARC Project (Machine Readable Cataloging), EDUCOM (Inter-University Communications Council). In the fall, involvement of the VA with the RMP, regional medical libraries, and the NLM were topics of prime interest. These conference topics serve to illustrate the educational emphasis necessitated by new conditions. These directions are underscored during visits by the Headquarters staff to the hospitals. The normal practices of intra-station detail for newly appointed librarians and, when funds permit, attendance at non-VA sponsored courses continue as previously.

I have indicated earlier that VA is under legislative requirement to co-ordinate its programs, to the extent practical, with those of the RMP for Heart Disease,
Cancer, and Early in 1968 th ary Service Headquarters in Washington
issued speci to all VA h to how VA medical libraries could
support RM . The co-or d utilization of VA resources is
proceeding a ry plannin us regions develops. It is a VA
objective to o g library s MP: local s through the
VA medical li e VA lib ough the hospital;
availability of sets; a library ons; and
training of non- VA lib pt to these
external respon e o ces and
personnel availa or ach are
requirements if Library

Service is looking to its senior librarians to be both librarians and educators. There is a vast educational job to be done and the format for education is now available in the VA hospital. This educational task has two aspects: to meet VA requirements, and to assist persons assigned library responsibilities in hospitals outside VA who lack educational background.

From the internal standpoint, VA has a number of approaches to the problem. The first of these is the so-called Work-Study Program. *Instituted in 1959, this* program was authorized in recognition of the impending retirements of many VA librarians. This year approximately one-third of all VA librarians are age sixty and above. The Work-Study Program *provides a work-for-pay opportunity in* VA libraries while the participant is enrolled in a graduate school of library science. Currently, 20 students are in this program and work in in-service situations developed *by the local hospital chief librarian. For junior librarians willing to transfer* and who have the capacity for broader responsibilities there is the Career Development Program designed to provide participation in projects of the Library Service Headquarters, attendance at professional meetings, and extra-VA educational opportunities.

It is believed that VA librarians at hospitals outside metropolitan areas are ideally suited for the training of community hospital librarians who lack such training. For the most part, VA librarians have been serving at their local hospitals for many years and therefore know their communities. They provide a library service from a resource which has been developing for over 20 years. Frequently, the VA librarian is the only academically qualified hospital librarian in the area and the VA medical library the strongest reference resource. It is apparent that the wheel has come full circle and that the future will see many examples of the VA librarian as the teacher in the 1970s.

My purpose, then, has been to tell you in narrative form what the educational program of the VA Library Service has been, is, and what it will possibly look like in the future. I have not gone into our internal planning for technological development or our conceptualizing of hospital medical libraries to be built in the VA system during the next decade. I have previously provided some insights concerning these areas in my article (1968) in the *Bulletin of the Medical Library Association*. The evaluative worth of these educational efforts must necessarily be supplied by the beneficiaries of the medical library program during the past 20 years.

I have tried to say that, as VA hospitals have changed from federal enclaves in various communities throughout the U.S.A. to active partners in and contributors to American medicine, so also has the VA medical library program changed. None of the hopes for tomorrow, however, can be realized without a penetration of the national needs for medical library manpower recruitment and training today. The VA library system of the next decade will no doubt be a contributing factor in assisting in the solution of library manpower needs, be they professional or non-professional. How significant a factor this national VA network will be can only be determined by others and at another time.

the program of the american hospital association

As indicated by the title of the paper, I have prepared some remarks concerning the institutes on library service conducted by the AHA. For this purpose I would recall two papers delivered at the Second International Congress on Medical Librarianship: Annan (1964) presented 'Library Technicians: Need, Training, Potential'; Yast (1964) presented '. . . And Gladly Teach: The American Hospital Association's Experience in Conducting Institutes on Hospital Librarianship'. I feel that both papers are as pertinent to education for medical librarianship today as they were when presented, in fact they are perhaps more so.

There is little doubt of the growing importance of the community hospital in the total system for the delivery of health care services in the U.S.A. As the RMP authorized by P.L.89-239 continues to develop, the community hospital will be the full partner with medical schools, medical centers, and other health-related institutions in the attainment of RMP objectives. It is therefore confidently expected that the community hospital role in the continuing education of physicians, in research, and in the clinical application of new technology will be one of evolving significance. Realistically, then, in terms of medical library support in many such institutions, is it possible or necessary to maintain a full library service under a professional librarian? Adams (1968), in an editorial 'Hospital Libraries as Learning Centers', tells us that hospital libraries are not only inadequately prepared and staffed to perform their functions, but also conceptually out of phase with what the future may require of them. With this I subscribe completely. The profession must turn to greater support from technicians.

Rees *et al.* (1968) have given us an excellent article on education and medical library manpower. In it they ask a number of relevant questions: who is responsible for the education of 'non-professional' medical librarians? For what are they to be trained? What, then, should be the educational content of their preparation? In summary, they make these succinct statements of the problem and their solution: 'It is reasonable to conclude that an increasingly large number of non-professional manpower will have to be deployed in medical libraries, and that appropriate educational programs must be designed in addition to those courses presently available for professional personnel. The level and content of non-professional educational programs have yet to be determined.'

There are no stock answers to the questions which Rees and his colleagues posed. It appears that many groups, colleges, junior colleges, and institutions are engaged in efforts to strengthen and increase the number of library technicians. It is my personal feeling, however, that the work of the AHA has been in the forefront of these endeavors since 1959. An examination of two brochures of the Association which were included in the kit of materials distributed to registrants at the 1968 Institute on Library Service at Philadelphia provides a partial basis for my conclusion that this type of sponsorship provides library on-the-job training with certain essential elements not otherwise readily available. The first brochure, *American Hospital Association Institutes for 1968*, lists such institutes as Nursing, Long-Term Care, Rehabilitation and Social Work, among others. It is useful to have Library

Service included in such a listing because it indicates to hospital administrators the interest of the AHA in the subject and also the fact that the library is an integral component of the hospital organizational structure. The second brochure, the program of the Institute, indicates that it is conducted by the AHA in collaboration with the Catholic Hospital Association and the Drexel Institute of Technology Graduate School of Library Science. I feel that this diversified approach to the training program, involving more people in its work, strengthens the base of the total effect. In addition, the brochure lists sponsorship by the Middle Atlantic Hospital Assembly, the Hospital Association of Pennsylvania, and the Delaware Valley Hospital Council. Most hospital administrators are associated with their local hospital organizations, and again such sponsorship provides local interest, contact, and participation.

This is not to say that the AHA is the only agency capable of encompassing the spectrum of national and local hospital administrative interest and support. I do say, however, that this pattern is worthy of further study and possible emulation as the library profession moves forward in the area of training.

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the medical librarian as a medical educator: the description of a course

J. Titley

Articles have appeared sporadically since the late 19th century on the importance of educating the medical student in the use of the index journals to medicine. Dr. Bayard Holmes in 1893 described a class he conducted with 36 medical students in Chicago at the Newberry Library, where instruction began on the range and variety of medical literature and culminated in a thesis prepared by the student illustrating his knowledge of the literature. Dr. Holmes concluded his description by saying: 'This first experiment in teaching methods of thesis-making in medicine ... satisfied me that the teaching of correct methods in library investigation to our average medical student is greatly practical.' Librarians and medical educators continue to agree that instruction in the location of printed information is necessary to the medical student.

In 1965 the Joint Committee of the Medical Library Association and Association of American Medical Colleges included in its report 'Guidelines for medical school libraries' the comment:

> *The medical school has a responsibility to each student to help him develop the skills necessary for consulting the available records and the ability to upgrade constantly his state of knowledge. Although the Library is a laboratory in which the staff should be carrying on this kind of teaching program in its every day contacts with students and other library users, there also should be a systematic program directed toward these goals ... instruction and experience in information handling should be a recognized part of the curriculum and should be presented in various levels during the educational program.*

There is, however, no agreement among either group (librarians or educators) as to, first, who should instruct and, second, whether the instruction should be formal or informal. A second report on medical school libraries (DuVal, 1967), prepared by the American Association of Medical Colleges in 1967 and largely written by medical educators, states firmly that:

> *One objective of the Library is to educate and familiarize the student of the health sciences with both the form in which the scholarly record is obtained and the means by which one gains access to it.*

This would indicate that medical educators assume that librarians will act as instructors in this area of the librarians' specialty. No recommendation, however, is made on how or when such instruction is to be offered.

In 1965 a brief questionnaire was sent to librarians of the then existing U.S. medical schools asking if they gave a credit-hour course of instruction, informal lectures, or if they planned to give a course in the future. Returns were received from 58 medical librarians, and the results showed that no formal course other than the one at the University of Louisville was offered. Though almost every school gave some type of lectures, the majority were a single-hour session during the freshmen orientation program. The comments made by several librarians on the questionnaire sent out

in 1965 show the diversity of view on how teaching should be done. One (Beatty, 1965) said:

I feel strongly that this instruction be given at a definite point of need. I have strong doubts that a required formal course spread over a quarter or a semester would be very valuable. If you give practical advice to those students who feel they need it, at or close to the time of need, you have done something that will stick.

Another librarian (Darling, 1965), however, said that though:

The medical school faculty and administration are very reluctant to take away any instruction time from basic science or clinical medicine, we plan to continue to urge this school to schedule time for library instruction, and do an effective job whenever the opportunity occurs.

A third librarian (Hunter, 1965) emphasized that he felt this teaching must be in the form of a practical course with 'testing, practical problems, and a demonstrated ability on the part of the students taking it.'

Two things in the 1965 survey that most librarians agreed upon were that a single lecture during freshmen orientation had little or no value, and that faculty is reluctant to take time from the basic sciences or the clinical courses in order to give instruction in information skills. Considering this latter point, these attempts which were squashed in the past by the cry that there was already too much to be taught in too little time can be answered now in many American medical schools. The trend of the past few years in curriculum revision has an emphasis on elective programs, correlation of basic and clinical sciences, that makes it possible to offer, if only to some students, training in the use of the literature. Parenthetically, it is ironic, in light of the increasing sophistication and proliferation of index and abstract journals which require knowledge of thesaurus construction or familiarity with computer indexing, that within the framework of medical education there is no method of introducing these tools to faculty or students.

Continuing education for the practicing physician in all other scientific areas is a primary concern recognized by both professional societies, such as the American Medical Association, and the knowledgeable public; the aims of the Regional Medical Program are an example of this. It is also apparent from the Regional Medical Program's emphasis on accessibility of printed information that the general medical world is becoming aware of the vacuum that exists for the physician between the available printed medical knowledge and his ability to find it. The course described here at the University of Louisville cannot fill that vacuum for the older man in practice, but for those who have graduated from the University of Louisville Medical School during the last five years, this course introduces them to the problems of locating printed information and gives them a few solutions to the problems.

The entering freshmen of the Medical School of the University of Louisville in the Fall of 1963 were the first students to take part in a massive curriculum revision which had been in planning the preceding four years. A major feature of this program was that freshmen and sophomore students would no longer, *en masse*, go to prescibed classes from 8 A.M. to 5 P.M., but rather would have their mornings free to select five credit hours of elective courses each semester, devoting the afternoons to the 'core' curriculum. In order to compress the previous curriculum into the afternoon

hours, all basic science courses were required to slash their teaching hours by one-third. The faculty, both within the Medical School and the University, was asked to offer appropriate courses for the elective program. The Librarian, with an appointment as Associate Professor of Medical Bibliography, presented the outline for a one-hour course, later enlarged to two credit hours, entitled 'The Use of the Index and Abstract Tools in Medicine.' Of the 98 freshmen who entered in the Fall of 1963, 22 students elected to take the course designated 'Medical Bibliography 151' in the catalog.

In planning the course, it has never been the intent to make medical students into information specialists, nor are the students expected to learn by rote names, dates, or specific characteristics of any of the index and abstract journals or reference tools. The intention, first, is to give the student an idea of the range of the primary and secondary journals; second, to give the student the realization that there are as many ways of locating information as there is information to be located. Finally, it is hoped that this introduction will help the student not only during his student years, but also in his year as a physician.

The format of the course has been reworked several times, each reworking coming closer to the aim of making the problems less artifical and making the class structure itself more closely related to the structure of the other courses the students are taking. In order to accomplish these aims in the present version, the class is divided into small groups of four to six. Each group is allowed to choose from a pre-selected group of topics the one topic on which they will work for the entire semester. The topics are broad enough to include the various facets of medicine, such as diagnosis, therapy, history, that are to be illustrated. Topics such as organ transplant, hallucinogenic drugs, and alcoholism are typical of those that have been worked on in the past.*

The assignments are structured to simulate information problems which the student will be faced with in later times; each of the four problems takes approximately four weeks to complete. During these weeks, the students attend two to three lectures, meet twice in their group with one of the two instructors for a 15-minute to a half-hour discussion and finally present a 15- to 30-minute report to the whole class. These meetings between the instructor and the small groups are one of the most valuable parts of the course, for it is then that the instructor becomes aware of the material omitted or misunderstood, and is able, on a much more efficient basis, to discuss information problems with the students. As a by-product of the course, the student's good habits of bibliographic verification and citation are developed and he is able to exercise his techniques of verbal and written expression.

Instead of a textbook, the student is given a folder at the beginning of the course which contains some 25 outlines prepared by the instructors. These outlines describe the basic index and abstract tools as well as dictionaries, anatomy atlases, and bibliographies on particular subjects such as books for a physician's office. Enough information is given on the outlines so that the students, when these particular tools are being

* In 1970 the method of instruction [illegible] the [illegible] of the [illegible] made of the 'auto-tutorial' approach instead of the lecture and [illegible]

discussed, do not have to take copious notes. This folder can also be retained by the student and used by him in later years as a reference guide.

Organizationally, the course begins with the usual introductory lecture stating aims, continuing with a physical description and tour of the Library. Most important is a lecture on what is a book and what is a journal, and particularly on what is that grey amorphous mass between the monograph and the periodical, such as published symposia and congresses.

As the introductory material is being presented, the students are simultaneously involved in the first of their series of problems. The first problem states that they have a patient with a particular illness; they are given one review article for background information and are told to locate physically in the library the articles cited. This assignment shows them why it is necessary to decide if a citation is a book or a journal, for until that is correctly determined the path for locating the item cannot be selected. This task also shows them the frustrations that occur when references are incorrectly cited or incompletely given.

The second problem is, now that they have found the basic articles, they want to find what subject headings to look under in the major index and abstract journals in order to find more information on the topic. From the first bibliography they were given, articles are selected published over a wide time period; the student must then locate these articles under subjects in the appropriate index and abstract journals, specifically *Index Medicus*, *Excerpta Medica*, *Biological Abstracts*, and *Chemical Abstracts*. From this task they determine under what subject headings their topic comes and how the headings change over a period of time; most important, they see how the headings vary from secondary tool to secondary tool. In addition, they are asked to check for additional articles which have cited the selected ones, thus involving *Science Citation Index*.

The third problem is, now that they have reviewed the literature, they should prepare to prescribe drug medication. They are asked to select the appropriate medication and then to review its expected effect, untoward effects, its counter-indications, the clinical and the experimental trials that the drug has undergone, its chemical structure, its various trade names, and its normal method of dispersal. Each of the foregoing points is to be documented by a citation to a standard authority or to a journal article.

For the fourth problem they are requested to write up a case history on their mythical patient with this disorder; for an introduction to the case history they must find out the disorder's history, its classic description, who first described it, and any other significant historical aspects of the condition.

Ninety-five medical students over a five-year period have taken the course (57 are enrolled in 1968/69), along with a dozen basic science graduate students and 15 members of the medical library staff. At the end of five years, students who had taken the Medical Bibliography course were compared with their fellow students to see if they had any unique characteristics or any common traits such as class standings, Medical College Admissions Test verbal scores, or library use. In class standing, the students taking Medical Bibliography were evenly distributed between the top, middle, and lower thirds of their classes. The five-year total ran 25 in the upper third, 30 in the

middle third, 23 in the lower third; therefore, the students as a whole were academically representative of the classes.

The student use of library material was examined for the two years 1965/66 and 1966/67 for which the records were available. Again those students taking the Medical Bibliography course did not show an appreciable difference from the average student in their class, despite the fact that there is a distinct correlation in the junior and senior classes between the frequency of use of library material and the class standing of the top ten and bottom ten students.

One other characteristic, which was thought might identify the particular student who was inclined to choose this course, was a high or low verbal ability. The verbal ability section of the student MCAT tests was examined. The results showed that three times the number of students taking the course (15) ranked exceptionally high (600 and over), in contrast to the number (5) ranking very poor (below 400). This is partially explained by knowing that fewer candidates with MCAT scores below 400 would be considered for admission.

Since some 25 to 30 faculty members act as course advisors to entering freshmen, it was conceivable that a few faculty members especially interested in information problems could be guiding students to this course. A review of this showed that almost every faculty member had had at least one of his advisees take the course. A poll was taken of students presently enrolled on how they happened to select the course; 12 indicated interest came from the description in the elective catalog, 14 said their advisor recommended it, and 6 said they learned of it from another student.

In the spring of 1968, the freshmen and sophomores of that year were asked by the Associate Dean of Curriculum to rate five different aspects of elective courses they had taken in a 1-2-3 sequence: (1) good; (2) average; and (3) bad. Eighteen of the 22 students who had taken Medical Bibliography in *1966/67* and *1967/68* responded to the questionnaire; of the 132 responses, 63 rated these aspects as good, 36 rated them average, and only 9 indicated one facet bad (Table I).

Table I. *Student evaluation of elective courses.*

	Good	Average	Bad
Grading technique	11	6	1
Course organization	9	7	2
Teacher's attitude	14	4	0
Opportunity for personal contact	13	4	1
Value of lectures	9	4	5

conclusion

An additional value of this course is that it can also be given to students in other disciplines of the health sciences: nursing, pharmacy, or graduate students in the basic sciences. Presently we are offering a *similar* course to sophomore dental students, introducing them to the index and abstract tools but emphasizing other forms of communication such as referral letters. This latest course with 57 dental students and our experience this past Fall with *56* medical students show us that major modifications have to be made if there are over 25 students taking it. We plan to experiment

with the use of various audio and audio-visual tools. The tour of the Library could be handled by a tape tour; the student could pick up the tape recorder and appropriate tape and follow the path outlined on it, as is often done now in art museums. The experience with the dental students course, a *required* course, shows that part of our success with the medical school course is because it is an *elective* rather than a *required* course.

It is more effective to teach a fifth or a half of a class who want to learn than to teach all of the class with a number who are not interested. We have seen in the Library medical students who took our course teaching other students who have not had it how to use MeSH and *Index Medicus* and *Science Citation Index*. This way the information is given to the student not originally motivated to take the course at a time when he needs it.

A by-product of this course is the closer relationship it has fostered between the faculty of the Library Department and the remaining faculty of the Medical School. There is more interaction between the two as they share common problems at curriculum committee meetings and advisor group meetings. Such interaction serves to emphasize the active academic and teaching role of the Library, de-emphasizing its image as wholly a custodial or archival department.

We have demonstrated that it is feasible to teach a formal credit course on the use of the index and abstract tools, and that it is most effective when the course is an elective one. Such a course is considered appropriate by members of the Association of American Medical Colleges, by the faculty of the school, and by the students themselves. It is the only bridge available to faculty and students between the changing complexities of the indexes and the information stored in the printed literature.

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drtc* and education for medical library service

A. Neelameghan

The application of scientific methods in management is aimed at conservation of resources, particularly human resources, in research, service production, and commodity production, at all levels. The conservation of the intellectual component of human resources is of vital concern. In this context, the development of systems for making available pinpointed and exhaustive information expeditiously to the specialists who can make use of it for further advances in their respective fields is an absolute necessity if wastage of human resources through unintended and unnecessary duplication of effort is to be reduced to a minimum. The development of such systems to serve the specialist has its roots in the traditional field of library service. However, this new responsibility emphasizing library service to specialist readers with nascent micro-thought is named variously as 'documentation', 'special library service', 'information service', etc., and the librarian undertaking it is named 'documentalist', 'special librarian', 'information scientist', etc.

With the increasing emphasis on library service as an essential support to research, service production, commodity production, and managerial activity, the provision for training of librarians for service in special libraries and documentation centres has assumed greater importance in the plans for raising the library manpower in the developed as well as developing countries In India, too, in the post-Independence period, with the implementation of her successive five-year plans, there has been appreciable expansion of educational, research, and industrial activities. Concurrently, the programmes for raising the library manpower necessary for special libraries, technical information centres, and documentation centres developing in the country have had to be thought out. It is in this context that the Documentation Research and Training Centre (DRTC) was established in Bangalore in 1962 by the Indian Statistical Institute.

documentation course at drtc

The *library personnel* required for a country may be considered in four categories:

1. Teachers and research workers: leaders of the profession;
2. Senior professionals for service in libraries;
3. Junior professionals for service in libraries; and
4. Semi-professionals for service in libraries.

The DRTC has concerned itself with the education of teachers, research workers, and senior professionals, leaving the training of the other categories of personnel to the care of the several other library schools in the country.

In consonance with its responsibility, the Centre has the following five-fold *objective*:

* Documentation Research and Training Centre, Bangalore.

1. To conduct research in library science;
2. To train persons for research in library science;
3. To train senior professionals and teachers of library science;
4. To design and develop improved documentation techniques, based on the findings of research, as a continuing activity; and
5. To give advisory service in documentation to research organizations and industries.

For *admission to the course*, a candidate should have:
1. A university degree in a subject other than library science and a university diploma or degree in library science or an equivalent; *or*
2. A Master's degree or equivalent in a subject and two years of practical experience in documentation.

Admission to the course is based on the merits of the candidate as judged by his academic record, and if necessary, performance in a special admission test held for the purpose or a personal interview by a selection committee (DRTC, 1968).

The DRTC course is a *full-time* one. The formal course of training extends over a period of 14 months. A candidate completing the formal course is required to submit, within six months thereafter, a dissertation in the form of report on the trend of research on a specific subject.

The *syllabus* of the documentation course is based on the syllabus developed and worked out by Ranganathan since 1948 in the M.Lib.Sc. course at Delhi University. The University Grants Commission generally gave its approval to this syllabus. Necessary modifications have been introduced in the syllabus to suit the training of documentalists. The syllabus is revised from time to time, on the basis of the experience gained and according to the requirements of the changing needs of documentation service. The course of studies presently consists of:
1. Universe of subjects: its development and structure;
2. Depth classification (theory);
3. Depth classification (practice);
4. Library cataloguing;
5. Documentation;
6. Management of the special library;
7. Mechanized document finding systems, and elements of statistical analysis;
8. A project in documentation; and
9. A project consisting of a survey of the trend in current research in a specific subject, to be completed within six months after the formal course.

Awards for professional attainment are as follows:
1. Associateship in Documentation, on the basis of examination and the in-term work (declared equivalent to the M.Lib.Sc. degree for appointment purposes by the Ministry of Education, India);
2. Associate Fellowship in Documentation, on the basis of approved research work done in DRTC; and

3. Fellowship in Documentation, for outstanding contributions and published works in the field of documentation.

The *programme of training* and the teaching techniques adopted facilitate intensive participation of the students in each subject of the course. To make this participation convenient and to help the student derive the fullest benefits from it, the number of students admitted to the course is limited to a maximum of eight; further, during the formal course, residence in DRTC is made obligatory.

A student admitted to the DRTC course receives a monthly *stipend* if he is not sponsored by any organization.

DRTC provides facilities for *visiting research scholars* to work under the guidance of the teaching staff on specific projects for short periods of two to three months. Since 1966, some 10 scholars have taken advantage of this facility.

The majority of candidates admitted to the DRTC are sponsored by different organizations, including those primarily concerned with biomedical sciences. The course offered in DRTC is basic to the efficient practice of library and documentation service in all subject fields. There is, however, adequate provision in the course to place emphasis on or to orient the student's training, at the appropriate points, to specific requirements of a particular subject field or kind of organization in which the student will work after completing the course. Thus, a slant in the training is given to meet the requirements of medical library service also. Some of the provisions for slanting the training programme are mentioned below.

A two-month *orientation course* precedes the formal course.

The *objectives* of the orientation course are to develop systematic thinking habits in the student, and to help the student prepare for higher productivity and derive fuller benefits from the formal course. In this context, some of the subjects introduced in the orientation course are:

1. Study of reference books;
2. Study of the development of various subjects; and
3. Routines common to special libraries.

In studying reference books, a medical librarian will *concentrate more on subjects in the biomedical field.* Similarly, he will study the development of different subjects. The assignments given to each student in each of these courses will have a specific bearing on the subjects each of them is likely to deal with in the library after completion of the course. The helpfulness, from the students' angle, of the provision of such slant in the study of reference books has recently been reported on by DRTC students (Singh *et al.*, 1968).

Efficient library service to specialists requires *deep analysis* of the subjects of documents and of the query – expressed as well as anticipated. Such analysis has to be based on a study of the attributes of the *universe of subjects*, such as its structure and development, including its tendency to become a continuum and infinite; its turbulently dynamic nature; its manifold multi-dimensional quality; the different modes of combination of ideas to form subjects; the pattern of inter-relation and the

different stages of development of a subject; and the frequency of incidence of seminal and near-seminal ideas in, and its impact on the development of, a subject. The need for such a study by the documentalist and the work done in the field have already been reported (Neelameghan, 1967*b*). Experience for over a decade has confirmed the value of inclusion of the subject 'Universe of Subjects: Its Structure and Development' as a compulsory one in an advanced course in library science (Neelameghan, 1967*a*; Langridge, 1969).

In the assignments to students of the course, the medical librarian gets an opportunity to study the structure and development — including the several attributes mentioned above — of the subjects in the biomedical field. For example, in a study of the rate of contribution of seminal and near-seminal ideas to different subjects, one of the students took up the field of medical sciences (Bavadekar *et al.*, 1967). A variety of assignments, studies, and student work is possible in the study of the universe of biomedical subjects (Devadason, 1969).

A sound knowledge of the *theory and practice of classification* and of the methodology for the design of different kinds of schemes for classification, particularly the freely-faceted type, is essential for a librarian serving specialist readers; for he will be concerned with analysis in depth of micro-documents, such as articles in periodicals, technical reports, and conference proceedings, to facilitate their classification and arrangement in a helpful sequence for efficient service. Further, he will also have to design and develop schemes for the depth classification of micro-subjects falling in the fields of specialization of his clientele. The study of the theory and practice of classification and the design and development of schemes for classfication forms an integral part of the course in DRTC. The theory of library classification (Ranganathan, 1967) and the methodology for the design and development of freely-faceted schemes for depth classification developed in DRTC (Neelameghan *et al.*, 1967; Ranganathan, 1964) are applicable to all subject fields. The student gets experience in the design and development of schemes for depth classification in his work on Project 1.

The medical librarian, having chosen a medical subject for his work in Project 1, has to design and develop a scheme for depth classification of subjects in that field. Thus, schemes for the depth classification of medical subjects have been developed by DRTC students for their respective projects.

The *principles and techniques of documentation* are similar in all subject fields. The medical librarian would make a thorough study of the organization of medical documentation at different levels: local, national, and international. For example, he would study in detail source documents and the abstracting and indexing services in the biomedical sciences — coverage, seepage, duplication, indexing methods, arrangement of entries, utility, efficiency, organizational aspects, and other attributes; MEDLARS; information exchange services and other sources of information in the biomedical field. He would also give particular attention to the studies available on the behaviour of scientists in the biomedical field in their search for information. In the use of electronic machinery in documentation, he would study the experiments done in the medical field and would also prefer to choose for his experiments a medical subject. The systems analysis and computer programs would be generally applicable in documentation in any subject field.

The *principles and methods of management* are essentially the same for all kinds of special libraries. This is also true of the application of statistical analysis and operations research to library management.

In the assignments in the course on specialist library management, there can be orientation to the requirements of medical library management. For example, the medical librarian may study the sources of book selection, special sources including book exchanges, for the procurement of medical documents, and identify the major publishing bodies including institutions and learned bodies in the biomedical subjects. In the planning of co-ordinated document procurement he would consider, in particular, the different medical documents exchange and distribution programmes — national, regional, and international, for example, the medical part of the Scandia Plan.

The main *objectives of Project 1* are to provide opportunities for the student:

1. To use in one project several of the techniques, such as subject analysis, classification, and cataloguing, that he may learn and practise separately in different subjects of the course, and thereby enable him to understand the significance of each of the techniques;
2. To realize that the various subjects and techniques which he had studied individually and separately are together essential for achieving competence in library service; and
3. To develop the ability to do creative work, thereby enabling him to take the first step in research.

These objectives are conveniently achieved by having as an integral part of the formal course a project consisting of the preparation of a complete, minutely classified, and adequately featured *documentation list* consisting of about 500 micro-documents on a specific subject. The design and development of a freely-faceted scheme for depth classification of the micro-subjects covered by the documentation list is an essential part of the project. The educational value, planning of the project, and the reports to be made by each student have been detailed in a recent paper (Neelameghan and Bhattacharyya, 1968). The techniques used in and the management aspects of the preparation of a documentation list are essentially the same whatever be the subject of the documentation list.

For a medical librarian, the specific subject of the majority of the documents included in the documentation list is chosen from the biomedical field. The project work gives him an opportunity to learn about the different source documents in the subject and experience in the design and development of schemes for depth classification, and to classify the subjects in the field. Librarians concerned with medical subjects have prepared documentation lists of the kind mentioned above on the following subjects as part of Project 1:

1. Human anatomy;
2. Diseases of the human body;
3. Effects of radiation on the human body;
4. Biology of bacteria;
5. Cell wall; and
6. Cytology.

The preparation of a *report on the trend of research* in a specific subject on the basis of a survey of recent micro-documents forms Project 2 of the course in DRTC. In the context of the present developments in the universe of subjects, and of document usage by specialists, the library's service should go further than the mere preparation of a documentation list. The work on a research project begins with a study of the state-of-art and likely trends in the subjects concerned. Hitherto, the librarian has been leaving it to the subject specialist himself to prepare the report on the state-of-art and the trend in a subject on the basis of a bibliography prepared by the library. Today, library science has developed techniques to analyse subjects in great depth and to present them in a pattern that exposes the kinds of relations between the ideas involved. In fact, the very principles for helpful sequence used in classification are helpful in arranging and expressing the component ideas in a subject in a helpful way to facilitate efficient communication (Neelameghan, 1968). Using these techniques, the librarian can view, in the proper perspective, the development of a subject in the past, in the present, and in the near future. In other words, with a basic knowledge of the subject, he can prepare a state-of-art or trend report in it. It is from this point of view that Project 2 of the course in DRTC has been made a trend report.

In fixing the time for the preparation of the trend report, the following factors are kept in view:

1. In preparation of a trend report, being an evolved form of documentation, subject knowledge and the knowledge of special library techniques acquired during the formal course of training will have to be utilized;
2. The trend report is to be on a specialized narrow subject and slanted to meet the specific requirement of specialist groups; therefore, the report is to be prepared in a place where the student has the facilities for intimate knowledge of the requirements of the group to be served, consultation with subject specialists, and access to current documents on the subject of the report; and
3. The student is to be enabled to raise himself to a higher level of creativity, that is, he needs to be given only minimum guidance by the teaching staff. Thus, while working on Project 2, the student is expected to work in a special library or documentation centre, and the trend report is to be submitted within six months after completion of the formal course.

A medical librarian would naturally choose for his trend report a subject that would be of interest to the specialists he is to serve. In the past, DRTC students have prepared trend reports on the following biomedical subjects:

1. Human anatomy (1960-5);
2. High altitude research with special reference to physiological studies (1960-5);
3. Radiation pharmacology (1960-5);
4. Cell biology (1956-60); and
5. Morphology of mitochondrion (1961-6).

conclusion

The course offered by DRTC gives a sound training in the theory and practice of special library service at an advanced level; there is adequate provision in the programme for the orientation of the studies, whenever necessary, to suit the requirements of medical library service. Reports of the findings of the research done by the staff and students of the Centre are usually published in the quarterly *Library Science with a Slant to Documentation*, and the volume of papers and proceedings of the annual DRTC Seminars.

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X

courses on the use of scientific literature for the medical staff

I. Wesley and O. Popović

In order to assist physicians and medical research workers to use more efficiently the scientific literature and other sources of relevant information, courses have been run since 1964 at several medical faculties in Yugoslavia. *The purpose was to outline the whole scientific information process, beginning with the techniques of searching for information and ending with the 'production' of information, i.e.,* writing scientific reports as the final stage of research, be it basic or applied, such as in clinical and general medical practice. It was not intended, indeed, to make half-baked librarians out of physicians, but to facilitate their mutual contacts and foster useful collaboration in searching for information. The enlightened user, who knows how to formulate questions, is always welcome and perforce better served by the librarian.

length and content of courses

The courses were incorporated into the curriculum of postgraduate training. They lasted between four days and one month. This means, that if the lectures and practical work were concentrated and the whole day was devoted to this instruction, a four-day course seemed to be indicated. If, on the other hand, single lectures were held on different days, intermingled with lectures on other topics of the postgraduate training programme, the courses extended over one month, although the intention was to present this subject integrally and rather early at the beginning of postgraduate education.

It was considered that at least eight hours should be devoted to lectures. On the other hand, it was felt unanimously that practical work is essential for the success of all the courses, the condensed as well as the protracted ones. The programme, therefore, included several hours of practical work, sixteen hours at least. The courses ended with a short discussion period.

The size of the classes varied, depending on the actual number of postgraduate students at different medical faculties. For the lectures we did not limit the attendance, while practical work was run in small groups of four students with one instructor. We always tried to assemble students who had related subject interests, but it is felt that this was of minor importance for the success of practical exercises. It is now considered that lectures of a general nature are needed in the field of librarianship and documentation coupled with practical literature search and perusal. The latter is often determined by the nature of the available library collection.

design of courses

It is not intended to present here a detailed subject description of the courses. We will therefore outline briefly their design and presentation. They consisted of four main topics preceded by a short introduction: basic concepts, scope, terminology.

The first topic, entitled 'Use of scientific information in medical research and practice', covered such questions as what to look for in scientific literature; where to find the facts; how to read, evaluate, and critically appraise the written word. Hints were further given on the intelligent use of various sources of information outside the scientific literature.

The second topic dealt with the routes of access to the sources of scientific information, especially the information contained in primary literature. Here the guides to the literature were described, analyzed, and compared to each other. Abstracting and indexing services were reviewed. The use of library catalogues was especially emphasized. Further on, the formulation of search requests was taught in more detail, stress being laid on the precision and clarity of the questions used for information retrieval. Manual, mechanized, and automatic searching techniques were only mentioned, since it is considered that they are primarily in the scope of librarians and information officers. A short survey of the supply of literature, with special regard to the use of microfilms and other kinds of reproductions completed this topic.

The third topic embraced all the activities that the research worker faces when the retrieved documents are already on his desk. Recording notes, abstracting, indexing, filing medical literature were described. Here stress was laid on the various filing systems that can be adapted to meet the individual needs of physicians and medical research workers of various disciplines. The basic concepts of the most widely used classification systems and those predominating in medical literature were also taught.

The fourth and last topic of the courses consisted of useful suggestions concerning the principles and practice of effective scientific writing in medicine. It was stressed that scientific papers should be fully adapted to their purpose of being the direct carriers of information in the transmission of medical knowledge. Special attention was therefore paid to the composition and style of manuscripts, with insistence on the preparation of the author's synopsis consistent with international standards. The need for careful checking of the list of references was emphasized. Finally, the role of editors of scientific periodicals was explained, stressing the valuable help they offer to the medical writer who is willing to co-operate.

achievements

The results of oral examinations held at the end of the first postgraduate term, where a few questions on information retrieval were included, proved to be satisfactory. An even more satisfactory result was the interest for scientific information aroused by this instruction as reflected in the answers to a questionnaire which has been regularly circulated one year after the completion of courses. The great majority of participants had made more frequent literature searching and had started filing their notes systematically. Many of them had asked for additional advice on various topics concerning effective information retrieval.

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comments

We think that after five years of experience several points should be re

1. Although it might sound too ambitious to assemble in one singl many different subjects as we did in our courses, we are of the opinion tha tial users of medical scientific information such complex introductory absolutely necessary. Let us repeat what we said in the introduction o munication: 'The purpose was to outline the whole scientific informati beginning with the techniques of searching for information and endir production of information.'

2. In order to demonstrate to the participants that even these complex i courses are of direct value to them, it is imperative that the greatest port should be devoted to practical work (searching, indexing, abstracting, piling, writing).

3. Additional knowledge might be obtained later on either by self (eventually with the assistance of librarians) or in special advanced courses dealing with the particular topics of medical library, documentation, and i retrieval practice.

4. As stated above, presently we are running these courses on the use a tion of scientific literature in the frame of postgraduate training, altho firmly convinced that their right place is in the last year of undergradu education. But, *potius sero quam numquam.*

national and regional systems: developed countries

[

the system of medical information in the u.s.s.r.

S. M. Bagdasaryan

The first information organizations were set up in the U.S.S.R. in the twenties of this century. Despite tremendous difficulties, over 25 medical journals were already being regularly published in the first years of Soviet power; by 1931, their number almost doubled. In the mid-forties the number of journals increased further, when publication of many journals was started in the Union Republics. Today more than 100 different journals are issued, in addition to a large number of proceedings, transactions, serials, and collections of articles. Whereas some 10 years ago all medical journals contained not more than 10,000 articles, at present they carry 23,000 items.

As well as increasing the number of medical periodicals, much emphasis was placed on review, abstracting, and bibliographic literature. In addition to original articles devoted to medical problems of current interest, medical journals published reviews of recent developments in Soviet and foreign medicine, and also had abstracting and bibliographic sections. A major bibliographic publication is the 'Yearbook of Soviet Medical Literature', an index to books and articles. Considerable work in the publication of bibliographic indexes is now also carried out in the Union Republics by medical libraries and research and educational establishments

In the early fifties, when the number of research institutions and higher educational establishments was growing from year to year and hundreds of thousands of physicians and scientific and educational workers were in need of qualitatively new types of information, the question was raised of reorganizing and improving the entire system of medical information in the country. A centralized body, the Department of Scientific Medical Information, was set up in 1956 under the Academy of Medical Sciences of the U.S.S.R. The first undertaking of this Department was the inauguration of *Meditsinskiĭ Referativnyĭ Zhurnal* (Medical Abstracts); the Department also prepared reviews and bibliographic indexes on topics of major interest.

Among the important tasks assigned to the Department were the determination of sources and types of medical information, the study of Soviet and foreign periodicals, the finding of an optimum structure for *Meditsinskiĭ Referativnyĭ Zhurnal*, the compilation of a subject heading list for that journal, and the development of methods for screening and processing the literature.

By the end of 1957, the following sources of medical information were recognized as the main ones: medical journals, monographs, transactions of research institutions, proceedings of congresses, meetings, conferences and symposia, author abstracts of doctoral and candidate's dissertations, research and development reports, abstracting journals, and bibliographic materials. Other important types of information also recognized were complete and abridged translations, in which scientific and practical workers of the Health Service have been showing special interest in the past few years.

There is a great demand for reviews, which enable health [illegible] keep abreast of the latest developments of medical [illegible] and [illegible] resorting to journals or monographs. Wide use is [illegible]

publications of news reports and brief communications on new treatment methods and drugs, and also of statistical (including demographic) data, *i.e.*, of materials which are usually not regarded as original information.

Meditsinskiĭ Referativnyĭ Zhurnal covers clinical disciplines, hygiene, health services, and medical history. Since most of that journal's readership are young physicians and scientific workers, its subject headings were selected making wide use of curricula for medical schools and other educational establishments.

In 1962 the Department of Scientific Medical Information was transformed into the All-Union Scientific Research Institute of Medical and Medico-Technical Information under the Ministry of Health of the U.S.S.R. (VNIIMI), which today is the leading institute for medical information in the Soviet Union. The Institute has the following main functions:

1. Development and improvement of new forms and methods of medical and medico-technical information;
2. Processing of information contained in Soviet and foreign literature and publication, on this basis, of abstracts and bibliographic information, topical reviews, card files, and reference mateiials;
3. Study and generalization of the latest accomplishments of Soviet and foreign science and technology, and scientific generalization and dissemination of advanced experience gained by the health services and medical industry;
4. Organization of the All-Union Reference Collection; refinement of the Universal Decimal Classification (UDC); provision of methodological assistance to medical publishers, libraries and medical and medico-technical information services in classifying all publications by UDC; and compilation of terminological and descriptor dictionaries;
5. Processing and preparation of information on research projects completed by scientific and educational institutions; and
6. Provision of methodological guidance to local departments and groups on medical and medico-technical information.

The Institute comprises the following units: scientific departments of theoretical and clinical medicine, prophylactic medicine, current information, social hygiene and health service organization (with a museum on health service in the U.S.S.R.); a department of reference collections, a methodological department, a bibliographic department, a department of international scientific relations, and a mechanization department. In addition, there is a department of document reproduction and an abstracting and translating bureau. The scientific departments conduct research work on principles of scientific medical information, mechanization and automation of information processes, development of terminological and descriptor dictionaries, and improvement of unified subject heading lists.

All research work at the Institute is co-ordinated by its Scientific Council. The Institute's publications are discussed by the Chief Editorial Board consisting of the Institute's workers as well as of scientists from other research organizations and curative and preventive services. Methodological problems are discussed by the Scientific Methodology Council. At the present time, research at the Institute is

mainly concerned with the development of a computerized medical information processing system and with the building of unified reference collections jointly with medical libraries of the country.

In 1967 postgraduate courses were organized at the Institute to prepare highly qualified specialists in medical information. To train and raise the qualifications of personnel, a department for the fundamentals of medical information is to be set up at the Institute later this year.

The past few years have seen radical changes in the system of medical information in the U.S S.R. In 1956, *i e.*, when information services were just beginning to appear within the Health Service system, all medical journals of the country annually covered an estimated 2,000 foreign publications; at the present time the publications of VNIIMI alone cover over 150,000 items of foreign literature. Compared with 1956, the total volume of secondary medical information materials published increased more than 6 times by the end of 1966, more than 7 times by 1967, and 7.5 times by 1968. By 1960, *i.e.*, three years after its initiation, the size of the *Meditsinskiĭ Referativnyĭ Zhurnal* had almost doubled. Since 1966, the size of express information bulletins has increased fivefold. Whereas in 1963 no bibliographic information on foreign literature was published in the U.S.S.R., 80,000 to 90,000 bibliographic items in 82 medical subjects were published annually in the following five years.

Since 1964 the Institute, in collaboration with a large number of highly qualified specialists from research and educational institutions, has been preparing and publishing reviews and topical collections of articles The Institute has developed a system for providing services to individual users and user groups

Listed above have been only the most important publications, without mentioning other types of current information containing important materials The largest secondary information publication of the Institute is its *Meditsinskiĭ Referativnyĭ Zhurnal* which covers over 2,000 Soviet and foreign periodicals, as well as many monographs and other publications in 38 medical disciplines.

Measures are now being taken to improve further the information services in the field of medicine. Today, the Soviet medical information service has the following structure: 1. VNIIMI, the leading institution in medical information in the country; 2. republican medical information departments; 3. medical information departments and groups in research institutions and educational establishments (including institutes for the advanced training of physicians); 4. the Central State Medical Library of the U.S.S.R. Ministry of Health; and 5. republican, regional, territorial, and other medical libraries.

The methodological guidance of information work in the Health Service system and the co-ordination of activities of information agencies and medical libraries are carried out by VNIIMI.

Medical information departments in a Union Republic have the following functions:

1. To co-ordinate information activities of research and educational institutions, curative and preventive services, and libraries, and provide methodological assistance to them;

. To build republican reference information collections and provide metho-
logical assistance in establishing such collections in research and other institu-
ons in the republic;
. To prepare reviews and collections of articles on the current status and new
evelopments in the fields of medicine and health services in the republic (ac-
ording to a unified plan worked out by VNIIMI);
. To provide a current awareness service to the heads of health organizations
nd leading specialists in the republic; and
To disseminate information on advances of medical science and health
rvice practices.

ledical information departments of a leading research institution have the
ing functions:
To build reference information collections and render reference services to
ecialists of the institution and related organizations;
To prepare reviews on the subjects of concern to the institution; and
To disseminate information on advances of medical science and health service
actices.

ledical information departments (sections, groups) of research institutions
tional establishments, institutes for advanced training of physicians) are
sible for the organization of reference information collections, the provision
rence services to workers of the institution, and the dissemination of informa-
: advances of medical science and health service practices.
n important role is played by the unified reference information collections of
journals, patent specifications and other materials being organized in various
cs, territories, regions, and research and educational establishments. Reference
ation collections include all materials available in medical information agencies
raries. The single scientific and methodological control of these collections,
ntrally and locally, enables them to be built up in a rational manner and to
health organizations and individual specialists with information promptly.
unified information service requires that UDC be used for classification and
g purposes by all information organizations and libraries.
e advantages to be gained from integrating the activities of information and
services are obvious, for joining the efforts of information and library workers
s them to eliminate duplication and thus reduce costs, to use the medical
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rmation agencies and libraries, to expand document microfilming and photo-
and to raise the level of research in information, bibliography, and librarian-

facilitate the retrieval of books and journal articles and to save user time, as
to speed up the publication of current awareness information, provisions have
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IIMI maintains and strengthens ties with foreign scientists and information,
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the Institute each year; during these visits questions of mutual interest are discussed.

As is well known, continuing scientific and technological progress leads to a tremendous growth of information, makes information more complicated, and introduces great difficulties into the way of those engaged in the study and historical analysis of data accumulated by science. This calls for new methods for and new approaches to the study of history of progress in every branch of science.

Along with problems associated with the identification, classification, storage, and transmission of information, special attention should be devoted to the historical aspect of information, if information activities are to develop successfully. The historical aspect of information is intimately bound up with problems of prediction of science development. Those investigators engaged in the field of information should pay less attention to a purely descriptive study of facts and increasingly concentrate on the analysis of causes and motive forces of scientific and technological progress, and to explain, on this basis, the historical phenomena and processes under investigation.

organization of technical assistance to the medical library network in the soviet union

V. N. Glinkina

The improvement of the library and bibliographic service available to medical workers in the U.S.S.R. is directly related to the needs and requests of theoretical and practical medicine. One of the crowning achievements of socialism is the Soviet Health Service, providing every member of the population with free and skilled medical care. To promote the development of this service, in 1968, in honour of the 50th anniversary of its establishment, decrees were passed by the Presidium of the Supreme Soviet of the U.S.S.R., the Council of Ministers of the U.S.S.R., and the Central Committee of the Communist Party defining tasks to be undertaken by workers in the Health Service in order to improve the medical care given to the population and to raise the standard of training and skill of physicians and higher-grade auxiliary workers. The decrees paid considerable attention to the extension of scientific research into the more important medical problems and to the introduction of scientific advances and technical developments into medical practice. These decrees have presented medical libraries with the task of broadening their activities in order to provide every medical institution and every physician with the latest medical literature and with information about it. The fulfilment of this task is inseparable from improvement of the technical assistance rendered to the medical libraries of the U.S.S.R. by centres specializing in library techniques. I consider that the level of librarianship as a whole is largely dependent on the standard and the state of such technical assistance.

Since it is impossible in the space of this short report to discuss the whole range of library techniques, I shall concentrate on those problems which are most complex and which require for their solution the combined efforts of all librarians, whether working in medical libraries providing specialized technical assistance or in libraries belonging to other systems and departments.

In my opinion, these problems are largely a question of co-ordination and co-operation in the management of the network of institutions supplying research workers and practitioners in the field of medicine with the latest literature and with information about it; co-ordination in the preparation and publishing of books on library techniques; improvement of the system for raising the standard of professional training of librarians; introduction of new and advanced forms of specialist services into the facilities offered by libraries.

The work of the Second International Congress of Medical Librarians shows that the provision of technical assistance by special medical libraries in the U.S.S.R. is based on the territorial principle. Experience of its work has convincingly demonstrated the many advantages of this principle, ensuring close liaison between bibliographic and library work and medical institutions in a particular republic (province or region) for the satisfaction of their requirements; technical assistance is brought directly to the libraries and is given with full consideration to local conditions and to the type of medical library.

Technical assistance is provided directly by the State Central Scientific Medical Library of the Ministry of Health of the U.S.S.R., the Foundation Library of the Academy of Medical Sciences, and by republican and regional scientific medical libraries. Unfortunately, not all regions of the U.S.S.R. have yet acquired medical libraries, and this is a handicap to the provision of precise technical assistance. In such cases, help is sought from regional scientific libraries of the Ministry of Culture of the U.S.S.R. These exist in all regional centres, they have considerable experience of the work, and they are able to help medical libraries in regions where no special centres for technical assistance exist. By co-operation in such matters, the efforts of libraries in all departments can be consolidated so as to solve the problem of providing a service for 100% of the specialists in the country.

I consider that forward planning of the development of library science and techniques at libraries of the U.S S.R. marks a great achievement in the task of co-ordinating technical assistance to the libraries of the country. Composite forward plans for scientific and technical work in all libraries in the U.S.S.R. are drawn up by the State Lenin Library, the centre for provision of assistance in library techniques in the U.S.S.R. These plans help to direct the efforts of all departmental centres for technical assistance towards the solution of the most urgent problems, the co-ordination of work on the convening of meetings, seminars, and scientific and practical conferences, the issuing of technical letters and instructions and recommendations for introduction of innovations based on experience, the organization of experimental work in libraries, and so on. An important place in the composite plans is occupied by the activity of technical assistance centres in preparing concrete suggestions and prototypes relating to rules and regulations, which are then sent to the ministries for examination and approval. Guided by this plan, centres for technical assistance have made great progress in recent years in organizing the network, improving library services for rural populations, raising the standard of scientific and technical assistance and developing social principles in librarianship.

In my own work in providing technical assistance, I also endeavour to co-operate with technical centres of information institutions. Joint activities (meetings, seminars, etc.) are held. Some medical libraries and information organs work to a common plan in this field (in the Baltic States, Uzbekistan, and so on).

The ability to solve important problems by concerted efforts is particularly necessary in connection with the development and publication of instructional literature on library techniques. The compiling of such technical literature is a serious and responsible task. In recent years, the scientific medical libraries of the U.S.S.R. have increased their output of such literature, and the literature itself has become more informative. Many centres for technical assistance have correctly understood their basic purpose: to work only on those problems which reflect specifically the activities of medical libraries. Admittedly, this principle is not adhered to always or by all libraries. To avoid possible duplication in the production of technical literature on particular aspects of library practice, the State Central Scientific Medical Library publishes composite plans for publication of technical literature by libraries belonging to the Ministry of Health as a supplement to the composite forward plans of the State Lenin Library of the U.S.S.R. As a result of pooling the efforts of all the technical

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assistance centres of medical libraries, during recent years about 200 items of nical instructional literature aimed at improving the work of libraries have published.

However, not all medical libraries have printing facilities at their disposa publishing their literature in sufficient quantity for distribution throughout network of medical libraries in the U.S.S.R. The Central Medical Library, in cases, allows other libraries to use its own facilities if they are available at the t

I attach great importance to the quality of these publications, for naturally the best should be distributed to the library network. To raise the standard of rev ing and editing of these publications, the State Central Scientific Medical Library set up a special editorial committee, including representatives of some of the me libraries.

It is impossible to improve the work of every library without raising the stan of training of librarians. This is a matter of the utmost importance to the whole of library science and techniques, and it calls for unceasing vigilance on the pa technical assistance centres.

Despite the fact that special institutes and faculties for training librarians exi the U.S.S.R., half the librarians working in medical libraries have had no trainin a specialized nature in librarianship. On the other hand, workers who have t trained in fields other than librarianship also need to study the organizatio library services.

It is now the common practice in medical libraries to hold courses of fur education in Moscow and the capitals of the various republics of the U.S.S Experience of the work of central libraries belonging to other departments, howe suggests that the problem can be solved in a different way: by transferring the plac further education to the periphery. By holding regional seminars for several nea republics and regions, it is possible to adapt the work to the local conditions an extend its scale by 5-6 times. Only one or two members of the staff can be sent to capital, but if courses are held locally, all who need to attend can do so.

However, if courses are to be organized locally, there must be a sufficient num of qualified teachers capable of giving instruction in the highly specialized fields organization of library work in medical libraries. Such specialists are necessary the classification of medical literature by subjects and organization of a sub catalogue, for the work of the reference and information departments, for work w patents and standards, for the mechanization of library work, and so on. The St Central Scientific Medical Library undertakes the task of training lecturers. Ev year we plan to hold one or two special seminars for the library workers of the rep lics and regions who, in turn, hold classes back at home. To assist in the work of th seminars, the State Central Scientific Medical Library issues prototype programmes a syllabi.

Nevertheless, in my opinion, we cannot do all that is necessary to raise t standard of training entirely by our own efforts. The republican and regional librar of the Ministry of Culture of the U.S.S.R., the scientific technical libraries, and t university libraries all have considerable experience of catalogue work, the mana ment of alphabetical and systematic catalogues, and other library matters which a

basically the same in libraries of all departments. These libraries also take action to raise the standards of training of librarians locally, and medical library workers can take an active part in this work. Local seminars on librarianship must be combined, in my opinion, with correspondence courses and with independent study of the literature on library science by all library workers. This can help to raise the standard of training of librarians, and thus must ultimately improve the service given to medical specialists throughout the country. The introduction of new methods into library practice is one of the most important aspects of technical assistance to medical libraries.

The opportunity to profit from experience is given by visits to and inspections of other libraries. We can learn much that is new from the medical and library periodicals, radio, television, and the cinema. Information on improved methods is spread by meetings and conferences, seminars and practical courses, regularly held every year by medical libraries. A particularly valuable contribution to this work is made by practical conferences concentrating on particular, specialized aspects of the provision of a library and bibliographic service.

When studying, generalizing, and spreading progressive experience, the ultimate purpose of this work must not be forgotten: the introduction of new developments into practice. This can help to reveal and eliminate defects and to bring backward libraries or sections of libraries up to the level of the more progressive. Much has been done in this direction in medical libraries in recent years, as is shown by the great improvement in operational statistics at some of them. However, despite the importance of introducing progressive measures as speedily as possible, the organization of this matter in the U.S.S.R. still leaves much to be desired. A certain method cannot be introduced quickly into all libraries, and various objective reasons are given why this should be so (lack of staff, of funds, of room, etc.). In my opinion, the introduction of new methods into practice is often hampered by the gulf between the organizational and technical sides of library work. Sufficient attention is paid to the spreading of experience, but its introduction is sometimes regarded as a matter for the conscience of library administrators, without any steps being taken to put the novel ideas to the test. Accordingly, many good beginnings — open access to shelves, progressive forms of reader service — are not in use at all medical libraries. We have, therefore, taken the decision to help libraries to introduce new measures into practice, to draw up plans for this purpose, and to devise groups of measures to facilitate their introduction. All centres of technical assistance consider that this work is a routine duty.

The introduction of progressive experience must not be regarded as simply copying a particular method. The experience of the Ryazan Regional Scientific Medical Library has deservedly earned a high reputation at the present time for having formed a group of information officers who receive regular instruction at the centre and then carry out the duty of providing information locally at the district hospitals. The directors of the Tambov, Kirov, a [illegible] small regions) have now taken similar [illegible] solve this problem in the same way in Khabarovsk or the Far-Eastern Maritime Provinces, which are larger in area. The experience of Ryazan must thus be adapted to suit the local conditions.

This example emphasizes once again that the introduction of progre
perience is the end result of considerable work devoted to its study and genera
to the careful selection of the most suitable methods which have been t
practice. It is a great pity that centres of technical assistance to the network of
libraries have not yet organized experimental trials of a new innovation, t
niques used, and the results of its application, *i.e.*, they have not followed th
experimental approach. The correct organization of a scientifically develop
nique of introduction of progressive developments in library science is a matt
is intimately linked with the scientific organization of work in libraries.

At the present time, great importance is attached in the U.S.S.R. to tl
tific organization of work as a means of increasing work productivity. This
equally to libraries. Unfortunately, libraries are not often planned with an e
feasibility of carrying out a particular job, and the introduction of a new
disturbs the routine: 'that is how it was done before'. By the introduction of s
organization of work, hidden reserves can be brought to light in the work of
libraries, individual library processes can be made more efficient, defini
norms can be established, the working conditions of the librarians can be in
and in this way the standard of the library service to medical workers throug
country can be raised.

An improvement of the service to specialists and the development and
perfecting of the whole range of library processes, as well as of the technica
library activities, are inconceivable without a solid scientific basis. In this con
the Central Medical Library and the republican, provincial, and regional libr
organizing their work not merely as centres for technical assistance, but
institutions for scientific research, studying scientific problems in the field of li
ship, bibliography, and information. Their solution will make it possible to
unified system of libraries and information services, to study the make-up
reading population and its inquiries, to improve the assembling and distrib
book stores in the country, to establish depositories, and to improve the sy
interlibrary communication and of composite catalogues.

the objectives of medical libraries and information centres in small nations

J. Křivinková

The problems of medical libraries are partly common in all countries; partly they vary according to the linguistic situation, to the size of the nation and of the state, to the economic conditions in the country, and to the social esteem attributed to biomedical sciences and health services. In small nations with old traditions in the arts and sciences where the biomedical sciences and health services achieve a satisfactory standard and, in some specialities or in some problems, reach the top, the functions of libraries in spreading medical knowledge are harder and more complicated than in big and rich nations.

One of the primary tasks of medical libraries in these countries is to overcome the language barrier in information flowing from abroad into their country as well as in the opposite direction out of their country towards the international scientific world. Language difficulties are often complicated by the economic situation of the country. Economics, especially the balance of import and export trade, determine the amount of foreign currency assigned for purchase of medical literature. This ration is not always adequate to the increase of medical knowledge and to the information needs of the medical profession. In these cases, the current awareness of practitioners and scientists in biomedical fields depends on the almost perfect organization and management of medical librarianship and on the work of the medical librarian, on his or her personal and professional qualities.

In such a situation, a thoroughly designed program of medical librarianship in its full complexity all over the country is of prime importance. The leading idea of the conception is to concentrate financial sources, manpower, human energy, and modern technology in one library, to build up a network of medical libraries across the country, and to promote mutual interlibrary co-operation, sharing of duties, and larger medical libraries helping the smaller ones.

In this design, a well-organized state or national medical library is a *conditio sine qua non.* In the national medical library, library resources, foreign currency for purchase of medical literature, and library technology tools are concentrated. Its medical book and periodical collections are the richest in the state, collocating the entire national medical book and periodical production from the oldest times and being updated regularly and systematically by careful selection of the best world medical literature. The national medical library is adequately staffed by fully trained librarians and equipped with reference tools, with the best available in reprography and other library technology. It renders service to local readers directly, to other readers by intermediary of interlibrary loan service. It also secures international interlibrary loan service for medical libraries. A special department is in charge of the development of the medical library network, of co-ordination and shared duties design, and of continuing education of medical librarians.

The medical library network consists of regional and district medical lib organized in successive grades. The regional medical library is establis

regional hospital (for approximately 1 to 1.25 million inhabitants). It is equipped with the contemporary national medical literature and, in more modest scale, with foreign medical books and periodicals and reprography technology. It is staffed with 5 to 8 workers, partly professional, partly clerical. The district medical library is established in the district hospital (for about 100 to 130,000 inhabitants). It comprises mainly the recent national medical literature. In this basic type of medical library, stress is laid not on the richess of the book and periodical collection, but on the extent and quality of library service. The fully trained librarian of the district library provides books and periodicals to her readers by interlibrary loan service and by rotation of periodicals: she obtains for them the reprographic and other library services rendered by the regional and national medical libraries and, in paramedical fields, by the state libraries for science and technology. She manages the reference libraries and small book collections in the hospitals and cure establishments administered by the district hospital. She offers expert help to these libraries' administrators who are generally non-professional.

It would be rather questionable whether a small nation in which medical librarianship suffers by the above-mentioned troubles would try to build up its own medical information system. Surely, there is no lack of brains which could elaborate the software of an information system as well as in other countries. But on technical grounds, in an information system, even the most ingenious design would be frustrated if the most modern equipment were not available. It is no secret that in small nations the number of computers is low, that the available types are rather obsolete, that the newest models of electronic equipment are reserved primarily for industry. The same shortcoming appears in reprography and automatic printing machinery.

Besides this purely technical deficiency there is a scale of other difficulties, namely, in the access to primary sources needed in an information system. The supply of medical literature is limited by economic measures and seriously hampered by the long delivery times. Not only the overseas postal delay, but also the clumsy inland book trade system cause a heavy retardation.

These are some, but not all, of the reasons why in such circumstances any information system could not be appropriately up to date and why it could not compete in speed and coverage with such information systems as MEDLARS and Excerpta Medica, for example. Even if the librarians of small nations are aware of the limitations and weak points of these systems, they do not want to duplicate the work performed abroad in better conditions. They can design specialized small information systems in fields not covered fully in their complexity by the big systems, as, for example, *Index Radiohygienicus*. Nevertheless, on the whole they consider it much more sensible and economically more feasible to rely upon the established publications and to make the best of all the products and by-products of the world informations systems.

These objections do not signify that small nations should not have their own information institutions. On the contrary, a national medical information centre is necessary in every country, but its objectives should be adapted to the real situation in technology and economics and to the information needs of the medical profession. In any case, its tasks should not include general medical bibliography, duplicating in

vernacular or even in congress languages the work of the existing big medical information systems.

First of all, the national medical information centre has to produce a national medical bibliography as recent and as complete as possible. No other medical information system can register a national medical production in all its depth and width, nor substitute for the national medical information centre in this duty. On the basis of a perfect national bibliography, the national medical information centre could co-operate with the big information systems by selecting, analysing, classifying, and indexing the most interesting papers of the national biomedical sciences for the use of a world bibliography. When such an agreement is not settled, the national medical information centre publishes selective annotated bibliographies of the national medical literature in one of the congress languages to inform the world biomedical community of the development and recent advances in biomedical and health sciences of its country.

To cope with the information needs of the biomedical scientists, the national medical information centre relies on the big information systems like MEDLARS, Excerpta Medica, Biological Abstracts, and Chemical Abstracts. As the need for knowledge of foreign languages for the scientist is obvious, there is no difficulty with the language barrier. The national medical information centre has the most complete collection of world reference and information tools in the country and a well-trained staff to search for the scientist or help him to find by himself the communications and information he needs for his work. The national medical information centre procures photocopies and reprints of desired papers, and secures by all available means the smooth flow of useful information towards the biomedical scientist. It works in close co-operation with information workers employed in research institutes and medical schools who are trained in the speciality of their institution and centered on the special problems of their clientele. The medical information centre takes charge of the continuing education of these information workers in biomedical sciences and of their instruction in the newer information technology.

Quite different is the situation in information needs of the practising physician and specialist. There are practitioners who continue to study foreign medical literature and who request literature searches on various problems in the national medical information centre. The language barrier is not an insurmountable obstacle in the medical profession. Nevertheless, the practising medical man is generally too busy and too tired to study his problems in a foreign language. He prefers to be informed in his speciality concisely, quickly, and in the vernacular. Therefore, the national medical information centre supplies him with information useful in his daily routine in the form of reviews of recent advances, surveys of progress, or selected abstracts in various medical specialities. These surveys and abstracts are produced under the supervision of leading specialists and in co-operation with experts in the treated problems.

summary

To sum up these remarks founded on fifteen years experience in Czechoslovak medical libraries and information centres: in small nations with [illegible]

Table III. *Distribution of answers to question A by hospital.*

	Number responding			Number using			
		PLs	ULs	NCMHI	NLM	Friends	Other
Fulton	23	4	15	4	1	8	5
Jefferson City	2	0	1	0	0	0	1
Farmington	19	7	1	1	1	9	5
Nevada	6	2	1	0	1	3	1
St. Joseph	20	10	5	0	0	11	4
Marshall	14	3	4	0	0	8	3
Rural	84	26	27	5	3	39	19
SLSH	61	24	31	2	2	31	6
MIP	17	2	13	2	2	2	5
SLSSH	6	0	1	0	0	0	1
Malcolm Bliss	25	6	18	1	2	8	0
WMMHC	16	2	13	0	0	5	6
Urban	125	34	76	5	6	46	18

Table IV. *Distribution of answers to question A by profession and by rural/urban location. Urban figures are italicized.*

	Number responding	Number using		
		PLs	ULs	Friends
Psychiatrist	16/ *32*	2/ *3*	6/*25*	5/*11*
Other M.D.	18/ *17*	5/ *1*	5/ *8*	11/ *1*
Psychologist	8/ *17*	0/ *0*	6/*16*	3/ *6*
Social worker	8/ *9*	5/ *2*	2/ *9*	2/ *4*
Nurse	14/ *27*	6/*19*	1/ *9*	8/*13*
Other therapist	12/ *6*	4/ *4*	5/ *2*	4/ *5*
Miscellaneous	3/ *9*	3/ *3*	1/ *2*	3/ *4*
Unknown	5/ *8*	1/ *2*	1/ *5*	3/ *2*
Total	84/*125*	26/*34*	27/*76*	39/*46*

If you compare the rural/urban responses by profession (Table IV), a significantly higher proportion of urban psychiatrists use university libraries than rural psychiatrists, but they do not differ in their use of friends. The non-psychiatric M.D.s show a different pattern, with a very high percentage of consultation with friends in the rural areas (61% rural to 6% urban). Physicians and psychologists use the public library significantly less than other respondents.

There were no surprises from the responses to question B, *How do you get new book information?* Predictably, the sources marked in order of 'yes' answers are as follows: book reviews, 112; friends, 108; publishers' notices, 104; book clubs, 63; indexes and abstracts, 57; and others, 24.

Predictably, also, in response to question C, 197 respondents were interested in notification of new books on a continuing basis. In answer to question D, 139 felt they would use their institutional library more if a book catalog were available; 40 did not think so.

Table V. *Rural/urban distribution of number of journals subscribed to by profession. Urban figures are italicized.*

	Profession, rural/urban							
Number of journals	Psychiatrist	Other M.D.	Psychologist	Social worker	Nurse	Other therapist	Miscellaneous	Totals
0	2/6	1/3	/3	2/	4/8	7/	1/4	41
1	2/7	/1	1/1	3/2	1/7	1/2	/2	30
2	2/3	4/4	/4	1/5	4/7	/2		36
3	3/3	5/	2/2	1/2	1/3		1/1	24
4	1/4	4/2	/2	1/1	/1	1/1	1/2	21
5	2/1	1/1	1/2	/1	1/	2/1		13
6	2/2	3/2	1/3		2/1			16
7	1/1		1/					3
8	/1		/1				1/	3
9			1/					1
10+	1/4		1/1					7
Total	16/32	18/13	8/19	8/11	13/27	11/6	4/9	195

Table VI. *Interest distribution by profession and rural/urban location. Urban figures are italicized.*

Number of interests	Unknown	Psychiatrist	Other M.D.	Psychologist	Social worker	Nurse	Other therapist	Miscellaneous	Totals
0	3/6	3/8	2/5	1/2	1/	1/4	/1	1/4	12/30
1	/1	1/	3/2			1/2	1/1	/1	6/ 7
2		5/4	2/2		1/2	1/4	1/		10/12
3		1/5	2/	/1	1/1	1/4	1/1	/1	6/13
4		/3	3/2	/1	1/1	1/2	2/		7/ 9
5		2/5	3/	/1	2/1	4/2		/1	11/10
6	1/1	2/	1/	1/2	1/2	/2	2/	/1	8/ 8
7		1/2	/1	1/3	/2	2/1			4/ 9
8			1/	2/3		/3	1/	1/1	5/ 7
9						/1	1/	1/	2/ 1
10		/2		1/2	/1	1/	1/		3/ 5
11		1/1	1/	/2	/1		1/		3/ 4
12				1/1		/1			1/ 2
13		/1				/1			2
14					1/			1/	2
15						1/	/1		1/ 1
16			/1	/1					2
18				1/			/1		1/ 1
19							/1		1
22		/1							1
Totals	4/8	16/32	18/13	8/19	8/11	[illegible]	[illegible]	4/9	[illegible]

An analysis of the responses to question E (Table V) shows 55% of the respondents subscribe to 2 or fewer professional journals. The average number of journal subscriptions is 2.77; the median, 2.72. When these data were analyzed by profession and location, using an analysis of variance, a highly significant difference between the professions was found, but no differences with regard to the rural/urban location nor an interaction between profession and location. Psychologists, psychiatrists, and physicians have the highest number of journal subscriptions; the former two are significantly different from nurses, social workers, and other therapists, while physicians subscribe to significantly more journals than nurses. It is quite likely that part of these differences are reflections of the practices of some professional societies, in that membership automatically brings one or more official journals; therefore, we may question whether these data reflect a higher degree of reading interest.

It was clear from the answers to question F, *Do you find your hospital library adequate for your information needs?*, that some new service was desired. Of 209 respondents, only 66 (32%) felt their institutional libraries adequate. The St. Louis State Hospital and MIP staff, which had access to a 5,000 volume collection and a staffed library with full services, accounted for 44 of the 66 satisfied respondents.

The last question of the survey (Table VI) asked the individual to detail a profile by listing his specific interests for an experimental SDI system. The purposes and definition of SDI were stated in the introductory paragraph preceding the question. The average number of interests was about five; the median was four. The distribution was somewhat skewed as the result of some people having indicated many interests. Those with fewer interests tended to list very general ones, whereas those with many interests tended to list more specific ones. Table VII itemizes the interests of those

Table VII. *Single interests.*

Schizophrenia, chronic — drug treatment
Children's programs in mental institutions
Child psychiatry
Current medical and surgical nursing trends
Occupational therapy in the treatment of mentally ill
Pathology
Mental hospital administration — research
Milieu therapy with schizophrenics
Etiology and treatment of psychiatric illness
Teaching emotionally disturbed children
Etiology of schizophrenia — research
Psychiatric patients — drug treatment

people who indicated only a single interest and illustrates the non-specific nature of their responses. The interest data were analyzed by means of an analysis of variance. Professions differed significantly from one another, but location was not a significant factor, nor was there an interaction between profession and location. Psychologists evidenced the highest number of interests, other therapists and social workers ran second, and psychiatrists and other physicians showed the fewest number of interests.

From this somewhat complex set of data, we can conjecture that psychologists tend to subscribe to more journals and have more interests, probably specific ones,

than do the other professional groups. Psychiatrists and physicians, on the other hand, while they subscribe to quite a few journals, have few interests. Those they have are probably general ones. Social workers and other therapists subscribe to fewer journals, but have fairly high number of interests, suggesting that this is a group particularly in need of information.

SDI study method

The results from the preliminary questionnaire suggested to the authors that the study group as a whole was relatively naïve, informationally speaking. Although a dissatisfaction with their current libraries appeared evident, the responders did not see much of the journal literature and were vague about their own information interests. They depend greatly on interpersonal exchange of information. The investigators felt that the education of the user group to the size of the body of literature available to them was an important initial part of the information system; otherwise, responses to the adequacy of the information system would be less meaningful.

It was decided to obtain descriptive data from the users of the proposed system to determine the system's impact. Group meetings were held at each institution to explain the purpose and uses of SDI. Some participants were interviewed in person and others by telephone to determine their SDI interest profiles and to gather information on their professional activities. Other information relating to their relative sophistication *vis-a-vis* libraries was gathered through mailed questionnaires. These methods proved to be fairly satisfactory inasmuch as co-operation in these initial steps was a prerequisite of participation in the project. The study group measures were incorporated in the following questionnaires:

1. *Library information questionnaire.* Questions relative to knowledge of library practice and usage. Also questions concerning information use habits: reprint collections, books and journals bought, and sources of information.
2. *Library use and reading record.* This form recorded place and time of literature use for a period of one month. The user was asked to enter on this form the time he spends reading (in 15-minute units), when and where (at home, in the office, in the library).
3. *Journal use record.* The list of 441 titles received in the MIP Library was sent to all participants. Which titles he regularly scanned, which titles he regularly read cover-to-cover, and which titles he usually glanced at, were to be indicated.
4. *Professional activity.* This questionnaire was administered by an interviewer. It focused on the professional activity of the individual as reflected in speeches or papers prepared and involvement in research.

selection of sdi technique

The selection of the type of SDI to be used was determined largely by the nature of the study group. Many of the SDI systems in operation now seem to be by-products of large information storage and retrieval systems based on the use of electronic data processing equipment.

Application of SDI systems to behavioral sciences literature is in the develop-

mental stages for a number of reasons. Compared to the 'hard' sciences, the vocabular in the behavioral sciences is plagued by vagueness and imprecision, making machin manipulation of the vocabulary difficult. Behavioral science as a discipline range from groups and social problems to individuals and medical problems. It embraces host of disciplines and sub-fields. The literature, for these reasons, is bulky an widely dispersed. One finds it in libraries of all kinds, business, law, medicine, chem istry, sociology, psychology, political science, and social work, to name a few, a well as in public and university library general collections.

Mental health professionals are to a large extent clinicians. It has been suggeste (Herner and Herner, 1967) that clinicians are not the heavy users of libraries tha theorists are. A possible underlying reason for this behavior is that it is very difficul for the clinician to find specific pieces of information in the form he would like. Hi experiences with the literature show so little prospect of reward for the energy neces sary to the search that he does not support library development. Another possibl reason for this behavior may lie in the complaint often heard at meetings and conven tions, that the researcher lacks interest in the practical applications of this work The reporting literature, as a result, does not make clear the clinical applicability o the research.

For the initial study, the investigators decided to stay as close to the origina materials as possible. The SDI system would disseminate information on articles abstracts, book reviews, and miscellaneous news notices as they appear in the journa literature. Only the first page of the article is reproduced and disseminated, but ful information on the other three categories is utilized.

A second mode could be used for comparison. Consisting of the same outpu materials, the difference is in format and dissemination. Whereas the first mod consists of materials sent at random as selected and processed from the literature, th second mode accumulates materials under larger subject groupings and disseminate them in booklet form.

Inasmuch as the primary intention of this SDI project was to determine th impact of an information system, and the systematic accumulation and indexing o documents for retrospective retrieval was not a consideration, the investigators decide to limit the indexing. Only the subject interests specified by the study group partici pants during the interviews were used as indexing terms.

conclusion

The philosophical concept governing the development of this SDI system is tha a 'good' system is directly related to a 'good' user. The exploration of an 'ideal system could not be the goal of this research. An initial survey of the Missour Division of Mental Diseases institutional libraries and staff information interests showed that no institutions other than MIP had a staffed library offering any services. The libraries, or more accurately, the book collections, consisted literally of books of such insufficient interest as not to be stolen.

This situation, the apogee of nearly 100 years of existence in some of these institutions, appears to be the result of a combination of a lack of funds and a lack of

interest, *i.e.*, knowledge of the printed resources, and the variety and depth of the production of valuable research information. On the other hand, it also seemed possible that the *status quo* represented a truly acceptable condition. Therefore, the significance in developing a behavioral sciences information network in Missouri lay in determining what effect, if any, the confluence of the right person with the right information has; whether, indeed, placing research results on the mental health worker's desk, under his nose, would have any impact.

It was an initial assumption, first, that the mental health personnel in Missouri are representative in training and experience of mental health workers throughout the country; second, that the Missouri Division of Mental Diseases incorporated institutions representative of the present-day variety of state-supported institutions from a large 2,000-bed hospital to a small intensive treatment unit, from travelling clinics to experimental community programs; and third, that the staff was relatively stable and would provide a homogeneous study group over a period of years. For these reasons, it was hoped that the results of the 2-year study engaging more than 300 individuals would have wide applicability.

Information in the behavioral sciences is rarely a life and death matter, which perhaps accounts for the relatively sanguine attitudes toward literature systems in this field. Still, vast sums are invested in mental health research, the results of which, perhaps, too infrequently reach the clinicians and administrators who might apply them.

reference

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7

national and regional systems: developing countries

problems of medical information systems and centres in developing countries. survey of work being done by who and unesco

H. A. Izant

When I was first confronted with the title of this session and with the particular theme that had been assigned to me, my first reaction was that there was virtually nothing of real substance to say. And if we take the terms 'medical information systems and centres' literally, my first impression still holds good. But before we can establish medical information centres and systems we have to have medical libraries, well-stocked, efficient, functioning medical libraries, providing a full range of services to their users. Such medical libraries are not common in developing countries, but UNESCO and WHO have done something, certainly not nearly as much as many would have hoped, to encourage their development and to assist their growth.

Of the specialized agencies of the United Nations, UNESCO is the organization responsible for the general development of libraries and documentation, and, working to some extent through international non-governmental organizations such as the International Federation of Library Associations (IFLA), the International Federation for Documentation (FID), and the International Council of Scientific Unions (ICSU), it has an impressive list of achievements in this field to its credit. The division of responsibility between UNESCO and WHO has remained clear. WHO, to generalize, is chiefly concerned with the organization of medical and public health services throughout the world so as to improve public and individual health, and approaches medical documentation and librarianship by way of the medical and allied professions who usually have definite ideas of the services they require to meet their needs. The UNESCO approach is from the other direction. UNESCO is concerned with the improvement, development, and extension of all library services and the techniques of librarianship and documentation in general, so that they may contribute to all branches of science, education, and culture, including, of course, the medical sciences, and hence to the implementation of long-range educational, scientific, social, and economic development policies. The two organizations, therefore, meet on common ground.

This is not the place, nor have I the time, to attempt to chronicle all the achievements of UNESCO in the development of library and documentation services. For those who are interested, there are a series of articles in the *UNESCO Bulletin for Libraries*, particularly the number for September and October 1966, while the bimonthly *Bibliography, Documentation and Terminology* chronicles the current activities. Here I wish to single out three aspects of particular interest to the development of medical libraries, namely: the education of librarians and documentalists, the development of scientific and technical documentation services, and a comparatively recent project in which UNESCO has joined ICSU in a study of the feasibility of a world science information system or, as it has been called, UNISIST, not a very happy neologism which, for once, is neither an abbreviation nor an acronym.

The first problem in the development of libraries that arises everywhere, although

admittedly it varies according to the country and the nature of the libraries concerned, is that of qualified staff. In all countries such staff are difficult to find and recruit. The professional status of the librarian is low, and his work, however attractive it may be from the intellectual standpoint, is generally inadequately recognized and paid, though carrying a multitude of obligations and responsibilities. Professional training for work in all kinds of libraries is a necessity, but it must be recognized that such training is also the most difficult and sometimes the most costly of all library problems to solve. It is the least spectacular in its efforts and yet has the most lasting results. In developing countries in Latin America, Asia, and Africa, the needs are greatest, and in these three continents are to be found the countries that need international assistance in library training. That UNESCO has recognized its responsibilities in this respect is shown by its work in Africa, with the establishment of the East African School of Librarianship at Makere University College in Kampala, Uganda, for English-speaking countries and, for French-speaking, of the *Centre Regional de Formation de Bibliothécaire de Dakar*, both of which have been organized with UNESCO's collaboration and aid. In Kampala, the first course, lasting 6 months and leading to a certificate, was started at the beginning of 1964 with 15 students. The first diploma course was inaugurated a year later, and now consists of 2 academic years of professional study for non-graduates of university entrance level. The diploma is the highest qualification in librarianship awarded in East African countries.

The *Centre* at Dakar was set up in 1962, and after 5 years of successful operation was transformed in September 1967 into a School for Librarians, Archivists and Documentalists, forming part of the University of Dakar and having the status of a university institute. Between November 1963 and June 1967 the *Centre* organized four 8-month courses which were attended by 83 participants from 18 French-speaking African countries. The transformation of the *Centre* into a university institute is likely to open up new prospects and to ensure the successful training of the librarians, archivists, and documentalists so urgently needed by Senegal and other French-speaking African countries.

The second aspect of UNESCO's work I wish to mention, the development of national scientific and technical documentation centres, is particularly relevant to our theme. National centres have been set up in a number of countries with the aid of the United Nations programme for technical assistance and in co-operation with the governments concerned to assist scientific, industrial, and economic progress. The first such centre was founded in Mexico City in 1950, to be followed 2 years later by the Indian National Scientific Documentation Centre (INSDOC) in New Delhi and in due course by ten others throughout the world. The functions are very similar. Their task is to collect, classify, and disseminate scientific and technical literature, periodicals, reports, etc., so as to provide copies and, where necessary, translations rapidly and cheaply to research workers, laboratories, industrial firms, in fact, to all interested individuals and organizations. The pattern of UNESCO assistance has taken the form of the provision of experts, fellowships, and equipment. The UNESCO team usually consists of 2 to 4 experts, a documentalist in charge of the centre, a second looking after publications, a bibliographer or translator, and an expert in photographic reproduction. The team usually stays in the country from 3 to 5 years, managing and

operating the centre and training the local staff who are to take over control on the departure of the international experts. Fellowships for local staff to study abroad, equipment and other materials not available locally, and basic collections of books and periodicals are also provided whenever necessary. Like the functions, the pattern of the services provided by the centres is similar: the procurement of literature, on request, from sources within or outside the country, the provision of photocopies, of translations of scientific and technical articles in foreign languages, the compilation of bibliographies on specific topics either in the form of simple lists of titles of papers or in a more extended form with abstracts, the holding of training courses in scientific documentation, the compilation of union lists of scientific periodicals available in the different libraries in the country.

In their early days, some of the centres regularly issued publications listing the current scientific literature received; the *Boletin* of the Mexico City Centre and the INSDOC *List of Current Scientific Literature* are examples of such publications, but in most cases the cost of preparing and printing such publications has become so prohibitively expensive that they have had to be suspended. Some centres, however, still continue to issue secondary periodicals dealing with scientific work in their country or region, a typical example being *Indian Science Abstracts*, published by INSDOC. Other centres, *e.g.*, the Pakistan National Scientific and Technical Documentation Centre (PANSDOC), issue on their own initiative bibliographies on subjects of particular interest to local scientific and technical institutions and industries.

It is too early for any real assessment of the effects of these centres. However, some positive elements have clearly emerged. Irrespective of their immediate value to national science and industry, they have served as focal points to demonstrate modern documentation and library techniques. Moreover, their use, as at INSDOC, as centres for short-term training courses in scientific documentation ensures the development of trained personnel to meet the needs not only of a country but of an entire region.

Finally, mention should be made of the important joint project in which UNESCO is associated with ICSU in studying the feasibility of a world science information system, UNISIST. A central committee composed of internationally recognized experts has now held three meetings, which were also attended by observers from the UN and the specialized agencies, as well as interested international organizations. One of the working groups set up is specifically concerned with the problems of the access of developing countries to the system, for it was recognized that it was essential in a project of this kind to remember that, despite practical difficulties, any world system that might be established must be of equal benefit to developing as well as developed countries. Unless this is done, the wide gap already existing between developing and developed countries in scientific information services will increase and, irrespective of the technical merits of any worldwide system set up, it would, from the international point of view, be a failure from the outset.

In WHO, once the medical relief programme of UNRRA for the rehabilitation of medical libraries in war-devastated areas had been completed, interest in further assistance to medical libraries was slow to develop. The appointment in January 1952 of a medical library consultant to the WHO Regional Office for Europe to survey and

report upon medical library services in certain European countries was probably premature, for only limited interest was evinced by Member States, and the project was allowed to lapse after two years. The reasons for this lack of interest are not far to seek. The health problems and needs of developing countries are immense, WHO's resources are limited, and, quite obviously when priorities were considered in the national ministry or department of health, more urgent proposals showing the possibility of immediate practical results and of bringing immediate benefits to the population were preferred. For similarly obvious reasons, in proposing fellowships for advanced training, member states nominated medical or health personnel.

However, in recent years, there has been a growing interest in the development of medical libraries as an integral part of the improvement and extension of medical education. Assistance to Member States in developing their institutions for the education and training of all types and kinds of medical and auxiliary personnel today constitutes an important and growing aspect of WHO's programmes of aid to developing countries. The acute shortage of physicians has led inevitably to growing pressure on medical schools to expand and to increase their intake of students and for new schools to be established. At times it must seem as though the size of the classes and the development of new schools has been determined more by the number of applicants and by the prevailing sense of urgency to train more doctors than by due regard for the availability of teachers, of space, of accommodation, and of equipment. In this kind of situation, it is inevitable that whatever library resources and facilities had existed should become seriously overtaxed.

A series of studies of medical schools in the WHO Eastern Mediterranean Region, made in preparation for the first Regional Conference on Medical Education held in Teheran in October 1962, showed all too frequently the desirability of an improvement in medical libraries. But before remedial steps could be taken, a diagnosis had to be made, and survey visits were paid to 30 medical libraries in 7 countries, most of them attached to medical schools or to the medical faculties of universities. The chief impression received was one of overtaxed resources struggling to keep abreast with growing demands. Accommodation for readers and for books was all too frequently inadequate; there was a voracious and loquacious demand by students for loan copies of standard works that few libraries were able to satisfy, and a barrier of varying proportions between readers and books.

The library collection, judged by American and European standards, was small in the number of textbooks, monographs, and bound volumes of periodicals and, above all, in the number of current periodicals. The shortage of copies of standard textbooks was a problem in itself. In these rapidly expanding medical schools, the students, unlike their American and European fellows, cannot afford to buy copies for their personal use. The price of textbooks in local currencies is high, sometimes as much as twice their published price, and relatively the cost is much greater. In one medical faculty, a circulating library of recommended textbooks has been set up to provide multiple copies for home reading. This collection, although serviced by library staff, is kept separate from the library proper and is financed by a special fee from each student. In another school, the students' union has organized a loan collection of basic works.

Irrespective, however, of the size and the contents of the library, the greatest barrier still remains the rigid system of closed access and the unnecessarily complicated systems for loans. And usually the librarian himself is the worst offender, for very good reasons: all too frequently the person in charge of the library is held financially responsible for any losses, usually by deduction from his salary. The obvious result of this financial liability is to turn the librarian into a rigid custodian determined at all costs to keep his stock intact.

The attitude of the teaching staff to the library was not always encouraging. New books and current years of periodicals are regarded as pieces of equipment to be removed to their departments, leaving the medical library a collection of out-of-date textbooks and obscure monographs.

I have left to the last the question of the role and status of the librarian, as this seems to me in many ways to be the most important aspect of all. Faced with the conflicting predatory demands of staff and students and haunted with the knowledge that he will have to make good any losses from his own pocket, the most enthusiastic and idealistic of librarians is forced sooner or later into the position of a rigid book minder. Thus the custodial character of the work results in a low salary and status, while these in turn do not naturally attract to the post persons with enthusiasm, energy, and initiative.

What could be done to improve library facilities in this area? Increased funds was an obvious answer, but it is by no means the complete one. In any case, funds of the size required to refurbish and replenish the book and periodical collections of some 30 libraries were and are not forthcoming. There is a shortage of books and periodicals, for the size of the collections makes that clear; but the problem of current textbooks for students is not really one to which the solution must be sought in the medical library.

Another answer is education and training: education of the university and college administrator, of the dean, professors, and teaching staff of the faculty in the importance of the medical library in the modern teaching of medicine, and training of the librarians and library staff in modern techniques of medical librarianship. The first represents a long-term propaganda effort, but it was believed that WHO could do something to improve the quality and quantity of library services by organizing short-term refresher courses for medical librarians. The first such course was held at the American University of Beirut, Lebanon, in the summer of 1964, 10 medical librarians from 5 countries being awarded WHO fellowships to attend the 6-week course in library science, followed by a special 4-week course in medical librarianship for which WHO provided the lecturers. Similar arrangements were made in 1965, but in 1966, owing to the suspension of the American University of Beirut's summer course, a different approach was tried: a 6-week intensive course in medical librarianship based upon the WHO Library in Geneva. The mornings were devoted to lectures and the afternoons to practical work, during which the students participated in the daily activities of the WHO Library. The close link between theoretical and practical work that could be established by this method was, I am convinced, extremely beneficial and provided a formula that could well be tried again. With the third training course, this form of assistance to medical libraries in the Middle East has

come to an end, and no plans have been made at the moment for any further, although a number of fellowships in medical librarianship have continued to be awarded. In all, 30 medical librarians from 8 countries attended the 3 courses and I am very happy to see that some of them are attending this Congress today.

The WHO efforts to improve the professional knowledge of medical librarians have not been confined to short-term courses. A number of surveys of medical libraries in different countries – Afghanistan, Ceylon, Malaya, Morocco, Turkey – have been made on the request of the governments, as a result of which, in a number of cases, WHO fellowships have been awarded for the training or study-tours of medical librarians. Again, I am pleased to say that one such WHO medical library fellow is with us today.

Steps, modest steps perhaps, have been taken, too, to improve the quality and quantity of the collections. Since 1966, 24 libraries in the Eastern Mediterranean Region have been supplied annually with subscriptions to 12 important medical periodicals, and, in all, over 1,500 subscriptions to periodicals are made available annually to medical schools and institutions throughout the world. In addition to gifts of medical literature, the Organization purchases books and periodicals for medical libraries of Member States against payments in local currencies, a service greatly appreciated in countries that experience difficulties in obtaining foreign currencies for that purpose. Assistance in obtaining older literature is provided by the International Exchange of Duplicate Medical Literature operated by the WHO Library. There are now 89 libraries in 41 countries co-operating in the scheme; and to date 165 lists comprising 25,000 items have been circulated to members, the WHO Library alone having distributed 72,000 pieces.

I have left to the last the most interesting and potentially the most far-reaching assistance of an international organization to the establishment of medical information centres in developing countries. I refer to the Regional Library of Medicine for South America, a library that has been set up with funds made available by the Ministries of Health and of Education and Culture of the Government of Brazil, the U.S. National Library of Medicine, the Commonwealth Fund, and the Pan American Health Organization (PAHO). The PAHO Regional Library of Medicine was formally opened in April 1967 in the School of Medicine of the Federal University of São Paulo, as a result of a 2-year study in biomedical communications involving meetings of experts concerned with problems of Latin American medical education, biomedical research, and a survey-tour of South American medical libraries. The new library is administered by PAHO, in close association with the São Paulo School of Medicine, and in co-operation with the NLM and the Pan American Federation of Associations of Medical Schools. Its objectives are to further the progress of biomedical research and the teaching and practice of medicine in South America, by providing easy access to a comprehensive collection of biomedical publications, and to a full range of services such as bibliographic searches, where necessary through MEDLARS demand searches, interlibrary loans, provision of photocopies, etc. These services will be provided either through existing libraries or directly to qualified inquirers, and it is hoped that co-operating libraries will be stimulated to develop their own resources. Undoubtedly, this new institution will serve as a demonstration and training centre

to foster the development of medical librarians and libraries throughout South America.

A Scientific Advisory Committee composed of internationally recognized authorities in medical librarianship and the health services has been set up to advise on its development. At its meeting in September 1968 this Committee, though recognizing that there were still many technical and administrative problems to be solved before full implementation of library services to all of South America became a reality, considered that the original objectives were sound and achievable.

If I have spoken at some length on this project for a regional library, it is because there is a growing belief that projects of this kind may well prove to be the pattern of the future. The publication explosion and the modern machine methods that we are forced to use to cope with it result in costs in equipment and demands for trained staff that few developing countries can possibly afford or provide. An ideal solution is undoubtedly a co-operative venture in which a group of countries collaborate to set up a regional medical library or information centre, manned by staff trained in modern sophisticated techniques and able to collaborate with the established automatic retrieval systems. It is significant that the working group of UNISIST concerned with the problems of developing countries has also recorded similar views. Perhaps, then, with the PAHO Regional Library of Medicine we are viewing the pattern for tomorrow for medical information centres and systems in developing countries.

II

problems of medical information systems and centers in developing countries. survey of work in south asia

S. A. Chitale

need for an information service

Information centres and systems are established to reduce the communication barriers between the producers and the consumers of knowledge. All research papers, journals, reports, conference proceedings, handbooks and, for that matter, every form of recorded thought growing out of our concern for human welfare becomes something which must be acquired, stored, and disseminated to those who need it. It has been said that all medical research begins and ends with the medical literature. 'The literature constitutes an integral part for the study of human biology and human disease. To limit its usefulness is to limit the scientist and to limit man's chance for the new level of health' (Fogarty, 1965). The growth rate of this literature is prodigious. The worldwide production of biomedical literature is estimated at more than 250,000 articles or 5,000,000 printed pages per year. Our scientists and research workers cannot be exposed to this stupendous amount of literature to search the information relevant and pertinent to their pursuits.

It is not only the quantity and variety of the medical literature which hampers the free flow of information, but the fact that the divisions between disciplines have faded and new disciplines have been formed, thus making the search of literature more complex.

Yet another factor contributing to the complexity of the literature search is the language barrier: 70% of the biomedical literature is published in languages other than English. Physicians are not expected to be linguists.

Various devices have been evolved to reduce these barriers of communication: bibliographic tools to control the literary output, library systems to collect and disseminate published literature, translation services to reduce the language barrier, and abstracting and machine-based searches with photoduplication devices to reduce the time-lag. But despite all these devices, the problem of searching required information still exists because health science workers may not know how and where to obtain the information desired. Moreover, the duplication of research and the habit of relying on personal contacts for information shows that they do not exploit the system as fully as they might. Scientists usually prefer the work they have taken as a vocation to the work involved in using or searching literature. They must, therefore, be assisted by librarians and information specialists if the valuable time of the scientist is to be utilized for uncovering new knowledge. Let us now proceed to examine the manner in which this problem is being tackled by the information systems of South Asia.

information systems of india and pakistan

We shall consider individually the various constituents of the information system, namely, literature, bibliographic tools, library systems, documentation and information centres, and clientele.

literature

The National Library of Medicine (NLM) at Bethesda, Maryland, is reported to have 1,300,000 documents of one form or another, all of which relate to health. There are more than 6,000 serial publications in the field of medicine alone, and these contain approximately 250,000 articles written in 40 different languages. The statistics given below provide a rough idea of India's contribution in this field:

During 1947-1959 1,004 medical books (excluding manuscripts, annual reports, and ephemeral material) were published, of which 818 were in Indian languages and 186 in English (*Indian Scientific and Technical Publications*, 1960).

During the period 1960-1965, as many as 756 medical books were published, 509 of which were in Indian languages and 247 in English (*Indian Scientific and Technical Publications*, 1966).

There are 144 medical periodicals published in India, of which 131 are in English and 13 in Indian languages (*Indian Scientific and Technical Publications*, 1966). The annual output of periodical medical literature in India is estimated at about 6,000 articles.

Quite a large number of manuscripts and rare books on Ayurvedic and other indigenous systems of medicine are lying scattered all over the country. These need to be collected, codified, translated, and brought to the notice of the medical profession, which can evaluate their contents in the present context, before they are eaten up by moths. The proud heritage of this great and traditional society lying hidden in these documents needs to be rediscovered. The NLM is negotiating a scheme to develop under P.L. 480 a centre at New Delhi for the acquisition and processing of Indian publications, reports, rare books, periodicals, manuscripts, etc.

bibliographic tools

Only a firm grasp of the obvious is needed to realize that without the appropriate bibliographic tools the search for literature would be futile. Periodicals have high birth and mortality rates, and even the current ones are so numerous that it is extremely difficult to keep track of them and to locate specific items when they are required (Simpson, 1968).

An interesting study of the indexing and abstracting periodicals both of international coverage and of national and regional coverage, and review periodicals received in Indian medical libraries has been made by Neelameghan (1962). It was pointed out that of 172 titles considered, 44 titles were not received in the country at all. More recently the position has improved, but there is still a gap of 30 titles to be filled, mostly in languages other than English.

Some of the important bibliographic tools in this field in India and Pakistan are:

Index to Indian Medical Periodicals, issued by the National Medical Library (NML).

Indian Science Abstracts, issued by the Indian National Scientific Documentation Centre (INSDOC).

Union Catalogue of Medical Periodicals in Indian Libraries, 5th ed., 1962, issued by NML.

Union Catalogue of Learned Periodical Publications in South Asia by S. R. Ranganathan *et al.*, v. 1: *Physical and Biological Sciences*, 1953, issued by the Indian Library Association.

Regional Union Catalogue of Scientific Serials: Delhi Medical Libraries, 1967, issued by INSDOC.

Directory of Indian Scientific Periodicals, 1967, issued by INSDOC.

Indian National Bibliography, issued by the National Library of India.

Catalogue of Civil Publications, issued by the Publication Branch of the Government of India.

Union Catalogue of Scientific and Technical Periodical Holdings of the Libraries in Pakistan, issued by the Pakistan National Scientific Documentation Centre (PANSDOC).

Pakistan Scientific Literature: Current Bibliography, issued by PANSDOC.

National Bibliography of Pakistan.

We shall describe three of these tools in brief:

The *Index to Indian Medical Periodicals* is a semi-annual publication started in 1959. It provides an alphabetically arranged subject and author index to the literature published in 144 Indian medical periodicals. The average time-lag between the publication of an article in a journal and its inclusion in the printed *Index* is about 10 months. This delay could be reduced by making the *Ind*[illegible]onthly and by having it printed promptly. The scope of the *Index* could also b[illegible] ved by scar[illegible] the literature published in non-medical serials. For the lit[illegible] lished b[illegible]59, retrospective indexing has been [illegible] ed recently by the

With the discontinuance [illegible] lication of the *Bi*[illegible] *Scient*
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In addition, more than a dozen Indian medical periodicals also carry reviews of and/or abstracts from current medical literature in each issue.

Apart from these bibliographic tools, there are a number of reference tools published for the benefit of the medical profession in India. These include:

Health Statistics of India
Directory of Medical Colleges in India
Directory of Hospitals in India
Directory of Specialised Treatment Centres in India
Pharmacopoeia of India
National Formulary of India
Indian Pharmaceutical Guide
Indian Medical Register
Indian Yearbook of Medical Sciences

The difficulty with these and similar publications from abroad is that one should know to use them and to exploit the information they carry. Secondly, no individual can acquire a working collection of them out of his own efforts. He must therefore turn to some nearby library for help in locating the required information.

library systems

There are about 260 medical libraries which have been set up for the use of members of medical and dental colleges, associations and societies, research institutions and government departments, pharmaceutical companies, and large hospitals in the country. Most of these libraries offer skeleton service to their clientele and suffer from all the typical disadvantages, namely, lack of space, of financial support, of adequate trained staff, and the total lack of any training in the use of the library by the clientele. With the attainment of independence in 1947, a general spurt started in the field of education, and research gained momentum during successive five-year plans. But the opening of so many institutions in the country in the past two decades has created problems of faculty, facility, and quality (Bhatt and Chitale, 1967).

While libraries attached to research institutions, medical colleges, and government departments are gradually improving their collections and services, other medical libraries are still in the formative stages. The National Medical Library at New Delhi, so designated from April 1966, is little better than other libraries from the point of view of its collection, staff and services, and its ability to secure interlibrary co-operation at local, regional, national, and international levels. The genesis, the existing position, and the development plans of the NML have been described in a recent article (Chitale and Bhatt, 1968).

In examining the status of medical college libraries in Pakistan we must remember that, after partition, Pakistan was left with very few medical colleges. There are now 15 medical schools. All these colleges have libraries, but none are managed by technically qualified personnel (Ashton, 1961). In Afghanistan there is only one medical college and the library is also not well equipped.

documentation and information centres

The establishment of INSDOC at New Delhi in 1952 by the Indian Government, with technical assistance from UNESCO, has fulfilled a long-felt need for an institution to serve as a vehicle for the acquisition, exchange, and dissemination of the scientific information required by Indian scientists engaged in research and development. Physicians, medical students, and research workers are the most regular and numerous users of the various services offered by the centre (Table I),

In addition to these services, INSDOC has been bringing out several useful publications, of which *Indian Science Abstracts* has already been described.

Table I. *Use of INSDOC services, 1966-67.*

Services	Total orders registered	Supplied for all sciences	Supplied for medical sciences	Percentage: cols. 4 to 3
Microfilms	5503	4309	639	14.8
Photocopies	8924	7462	1299	17.4
Bibliographies	156	139	26	18.7
Translations	1201	916	76	8.3

In an interesting survey of the existing reprography centres in India (Nagarajan, 1967), it has been estimated that the output of reprography work in India has increased 2½ times within a decade. There being no documentation and information centre exclusively for medical sciences, the researchers and scientists in this field depend on the reprographic services of other centres. In addition to the services of INSDOC at New Delhi and the Regional Centre at Bangalore, the medical profession utilizes the services of the Indian Association of Special Libraries and Information Centres at Calcutta, the Central Research Institute at Kasauli, and the NML at New Delhi. The NML has to arrange these services through other regional, national, and international centres as it has yet to acquire its own reprography equipment.

PANSDOC was established in 1957 with technical assistance from UNESCO. Its aims and objectives are similar to those of INSDOC.

clientele

The information needs of 12,000 students in 91 medical colleges and 14 dental colleges, of 108,240 registered practising physicians and more than 80,000 other physicians, of 50,000 nurses and 41,000 auxiliary nurses and midwives, and of a large number of pharmacists, dental and X-ray technicians, and other paramedical personnel pose a great challenge to the existing information system in India. With the increase in the population, the development and research activities are bound to increase also. It has been stated by Prof. D. R. Gadgil at the Conference on the Application of Science and Technology to the Development of Asia (CASTASIA), New Delhi, August 1968, that the research expenditure in five-year plans in India has increased in the past two decades from Rs. 55,000,000 to Rs. 1,158,000,000, leading to a phenomenal four-fold increase of science-based professionals in the country. All these medical and paramedical personnel do not have easy access to information

centres. Hardly 20% of them, mostly in urban areas, have access to such centres, but the remaining 80% also constitute potential information seekers.

existing problems

The foregoing analysis of the existing information network clearly points towards the problems that we face. We may enumerate them as follows:

Dearth of Indian publications. We have already noted that the bulk of our literature needs comes from imported publications: books, periodicals, reference and bibliographic tools. The indigenous production of standard works in medical sciences is yet to make its mark, in spite of the available know-how in this country. The heavy reliance on imported knowledge has dangerous potentials, concern about which was voiced by several developing countries at the recent CASTASIA conference.

The specific areas where there is scope for improvement include current awareness services for quick dissemination of information, indexing and abstracting services in medical and related sciences (Neelameghan, 1960), reference tools like directories, dictionaries, encyclopaedias and yearbooks, standard textbooks and monographs more suited to the country's local requirements, and an organized book-trade.

Distance from modern medical information centres. This is really a great handicap, second only to the paucity of foreign exchange, in the free flow of information to our research workers. The average delay in obtaining microfilms, photocopies and translations from abroad is 4 to 6 months. With the ordering of books, the delay is generally 6 to 8 months, and periodicals take 3 to 4 months to reach India after publication. Postal delays and missing issues are not uncommon, and air mail charges are prohibitive.

Lack of facilities vital to an efficient information service. An efficient information service should be backed by an efficient library system, documentation and information centres, and trained personnel, in addition to literature and bibliographic tools.

Almost all the medical libraries in this region suffer from lack of funds to improve their services. This apathy towards libraries is evident not only in medical libraries but also in other scientific and technical libraries in the country. There is no specialized training for medical librarianship in India, while the future of a medical library depends more on the personal efforts and interest of the librarian than on any other factor. Pay scales for librarians are also not such as to attract the really talented personnel in the profession. Library-utilizing medical students and teachers, practising physicians, and research workers are not always attentive to their information needs and frequently abandon their search for literature. They rely more on personal contacts than on utilizing the available information resources. The situation has been made more critical for want of a co-ordinating agency.

Medical libraries are more concerned with service to their clientele from their own collections and seldom exploit the possibility of interlibrary co-operation. The only visible form of co-operation is perhaps in the field of union catalogues and infrequent interlibrary loans. There is a very great scope for co-operation in other fields, such as acquisition, processing, and duplicate exchange.

The documentation and information centres also suffer from more or less similar ills, though they are better organized than the libraries. Nagarajan (1967) has

shown that somewhat chaotic conditions are prevailing at present, wherein one finds ill-advisedly chosen equipment which is not being fully utilized, or, in some cases, systems that have been set up with equipment inadequately suited to the requirements, or for which materials and spare parts cannot be obtained easily in India.

Paucity of funds. Most of the problems of our information network could be solved if more funds were made available. It is not that we are unaware of the latest techniques of information storage and retrieval or that we do not wish to improve the existing conditions, but that all our development plans are held up for want of funds. The foreign exchange difficulty is probably the greatest hurdle in the way of importing more publications and equipment for our institutions.

Lack of co-operation among neighbouring countries. With the exception of Japan, all Asian countries have almost similar problems concerning biomedical communications. Japan's contribution to current world biomedical literature ranks fifth.

Despite these common problems, Asian nations have apparently not made a serious effort to solve them on a co-operative basis. The mutual exchange of information among these countries is very little. Even the documentation centres established in some of these countries through UNESCO assistance do not have an unhampered exchange of information between them. Whatever little tendency to co-operate is visible is entirely due to UNESCO's active interest in solving the problems of these developing countries, and to the enthusiasm of the heads of a few centres. Insofar as medical libraries are concerned, there are stray instances of mutual co-operation. The reasons for this handicap may be financial, linguistic, or political.

recommended remedial measures

A detailed study of UNESCO's work in Asia relating to libraries, documentation centres, and archives made by Kesavan (1966) suggested several ways for improving the prevailing conditions. Important ones are launching well-thought-out systematic library projects; appointing regional experts to advise and assist national libraries, together with stepping up funds for experts, fellowships, and equipment; surveying and analysing the existing training facilities in librarianship, with recommendations of courses suitable to the needs of the Asian countries; intensifying the UNESCO book coupon scheme to facilitate procurement of scientific information from the various centres in the developed countries; setting up a regional centre for Asia to act as a clearing house for scientific information; providing reprography equipment with the assurance of a regular supply of necessary operating materials and spare parts; and forming an information grid between different documentation centres in Asia.

The text of the priority actions plan for the participating countries in the CAST-ASIA (1968) includes: 'The development of information and documentation facilities through strengthening existing centres; establishing new centres and links between national centres; surveying and rationalizing existing systems and making maximum use of modern techniques of reproduction, abstracting and data-processing, considering establishment of one or more regional information clearing houses.'

All these recommendations are equally useful for medical information systems and centres in Asia. It may be added that to implement all or some of these recommendations, external assistance would be necessary. This assistance may very well

be utilized for automation of our medical libraries and information centres. But a word of caution spelled out by Wasserman (1965) should not be ignored. He warns that before variations from conventional patterns of information retrieval can even be introduced, there must first come a fundamental reassessment of the precise commitment and responsibility of the library based upon the fuller understanding of the actual information requirements and uses of the several clienteles which it serves.

Another important step towards improvement of the information service would be to start special courses in medical librarianship and information science. The *NML has a scheme in the fourth five-year plan to start a refresher course for working* medical librarians in India.

If health sciences workers are trained in the use of literature and recognize the importance of the literature search, they can use the system to lower the barriers of biomedical communication which they have to face.

The NLM is playing a leading role in removing the barriers of biomedical communication: MEDLARS is a reflection of the leadership that medicine has taken in information handling. Dr. Cummings (1966) believes that libraries should offer themselves aggressively as a part of the communications matrix for health programmes. The NML will have to take an active part in improving the existing facilities for literature searching in India. The experience and co-operation of the NLM could be exploited for this purpose. We should be prepared to use computer-based information systems, the impact of which we have now begun to feel. To cite Dr. Cummings (1966): 'The next few decades will show whether we, too, can adopt to a social transformation and live with new open biomedical communications without barriers. If we are willing to change, and change in a way which medicine accepts, the library will become the active information center for the health sciences.'

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problems of medical information systems and centers in developing countries. survey of work in latin america

A. M. Sandoval

The population explosion might be one of its causal agents, but the fact is that already for several years the scientific and technical development of Latin American countries has proceeded at a progressively greater speed. Underlying the latter must be a certain degree of scientific and technical information, since otherwise this development could not be explained.

Both the population growth (one of the highest in the world) and the scientific development unavoidably lead to the need for increased medical services. It is no wonder, then, that physicians greatly outnumber all other Latin American professionals, with an approximate number of 115,000, plus more than 25,000 dentists and some 175,000 other health professionals. There are perhaps 15,000 investigators, including part-time research workers, involved in biomedical research. About 6,000 graduates are produced annually by the medical schools in the region.

It is only a natural result that about half of the *Instituto Brasileiro de Bibliografia e Documentação* services have covered the medical field and that the former *Centro de Documentación Científica y Técnica de México,* during its last four years of activity when statistics were recorded, increased the volume of distributed photocopies from 3,636 in 1956 to 8,773 in 1959, and the respective percentages of medical documents jumped from 38% to 60% of the total. It is worth mentioning that in the last year recorded, 1,991 documents (with 10,199 pages) were supplied on loan by the U.S. National Library of Medicine. However, ten years later, biomedical communication in Latin America continues to be hampered by serious inadequacies, and it is no wonder that the NLM is now the most important single purveyor of documents to the region, and over half of the NLM's loans to foreign countries go to Latin America.

It is true that, at least in Mexico (and likely also in the other Latin American countries), the largest number of newly organized libraries in the last decade are those specialized in the biomedical fields, but few have reached high levels of efficiency, if their holdings, organization, and services are taken into consideration. As a matter of fact, in Latin America, medical library resources and services are meager and inadequate judged by modern standards of library science and by the need for information in biomedical research and the teaching and practice of medicine.

When the number of volumes in Latin American medical school libraries are surveyed, 50 institutions yield a wide range from 500,000 to 81; but in terms of housekeeping and organization the largest one seems to have very serious deficiencies, and despite the size of the collection it shows little evidence that many current monographs have been added; as for the smallest medical library in Latin America, one wonders what kind of medicine is taught on those meager grounds.

There are a little more than 300 medical libraries in the region, but most of them appear to have been neglected for years, a large part of their collections being obviously only of antiquarian interest, with very little current material. Distinguished visitors

have reported that in none of the medical libraries in the capital city of one of the most important countries was there a copy of the *Cumulative Index Medicus*. This is not to say that there are no exceptions to this general statement, which seem more relevant the more exceptional they are, especially in the São Paulo area, and isolated libraries in Chile, Venezuela, Argentina, and Mexico.

But no matter how much libraries are neglected, and how much library services are overlooked, and how little need of documentation and specialized information Latin Americans appear to have, there is no question that hundreds of thousands of students and professionals, plus more thousands of teachers and investigators, have to rely on medical documents in libraries, institutional or private, for their work. The best demonstration of this is that, as mentioned above, more than half of the NLM loans to foreign countries go to Latin America, whose countries received a total of 22,126 services from this library during the fiscal years 1967 and 1968, Brazil alone taking about one-third of this total.

All the above problems are well known by both librarians and medical users (either actual or potential) of Latin American libraries. But although these facts have been for a long time in the minds of many, organized efforts for developing libraries, at the scale and level that the countries and the region need, have been very scant and unsustained. Therefore, we should not be surprised if it is from outside that motivation and support is pouring into the area to develop what appear to be the most promising projects of the present.

Let us now see what may be considered the outstanding medical library activities in Latin America, beginning by saying that the list will not be complete, since the area covered is overwhelmingly large and heterogeneous, and the writer accepts beforehand that his sources of information are incomplete.

In recognition of Latin American needs in the field of medical libraries, and of the great importance to biomedical research of the effective communication of scientific literature, experts on the field from various institutions, representing mainly the Pan American Health Organization and the NLM, met in Washington in January 1965 to discuss this problem, and recommended strongly that one effective way of responding to the needs would be to establish a regional medical library center in Latin America. The center, as well as supplying a strong central core of information resources upon which the entire Latin American biomedical community could draw, would also serve to introduce some of the newer communications technologies, such as computerized systems of information storage and retrieval.

The recommendation was followed by the visit of two experts to medical libraries in South America. Among other good impressions, the visitors were impressed by the network of biomedical libraries in the area of São Paulo, and especially by the library of the *Escola Paulista de Medicina* which had the advantage, among others, of being in a separate building.

Based on the December 1964 agreement between the Brazilian Government and the Technical Assistance Board of the United Nations, in January 1967 the Government of Brazil, PAHO, and the *Escola Paulista de Medicina*, considering that full, efficient, and continuing dissemination of biomedical information is essential to the progress of biomedical research and to the teaching and practice of medicine, agreed

on the establishment of a *regional library of medicine for South America* in the *Escola*, being an international agency administered by PAHO in close affiliation with the *Escola*.

The Director (a physician) of the *Biblioteca Regional de Medicina* (BIREME) was appointed by PAHO, which also appointed a Technical Advisory Committee to advise the Director on technical aspects of policy, programming, administration, and evaluation of library activities.

The functions of BIREME, which is closely linked with the NLM for technical services, are those so well known to all medical librarians in the world. Besides serving the broad Latin American region, two remarkable feats have been the two-fold increase of its subscription list and the contribution of some 50,000 items of back issues from the U.S. Book Exchange, which will unquestionably make this library the most self-sufficient in current issues of journals in the region. Also of importance is the fact that BIREME is co-ordinating interlibrary loans, with special reference to loans from the NLM.

But the most promising fact, as far as sufficiency is concerned, is the existence of a network of nearly 40 biomedical libraries in the state of São Paulo, well managed by capable librarians. This co-operative group has produced a union catalog of their holdings which, well used, is proving to be a remarkable tool.

In 1968 BIREME launched its full-scale services in Brazil on an experimental basis. In one more year these services will be expanded to cover the rest of South America.

In 1965 the Rector of the National University of Mexico supported a project for training in library science young graduates of the several professional schools, the libraries of which were not in the hands of trained librarians. The project included the provision of positions as directors of their respective libraries, at the full-time researcher-B level, for those completing the training. This offered an entirely new aspect to library work in the University of Mexico, and probably in any other Latin American university.

Though the project faced serious difficulties, the medical graduate received partial training at the University of Texas School of Library Science and special training at the NLM. Upon his return, the full-time position was granted, and under his leadership the library services of the Medical School were reorganized and co-ordinated with those of other biomedical libraries in the University, all of which led to the organization of a Medical Documentation Service housed in the School.

In August 1967 the Latin American Commission of the International Federation of Documentation (FID/CLA) met in Mexico City. This writer represented the Medical School of the National University of Mexico.

From the several recommendations produced, the one concerning the need of offering courses on modern documentation techniques to university students was put to the attention of the Director of the School, who immediately grasped the importance of the subject and accepted the suggestion of including a course on medical documentation among the several optional courses in the curriculum. A program was elaborated with a total of 56 hours, divided in two halves of theoretical and practical classes of 28 each. Experience is demonstrating the need of stressing the practical more than

theoretical side of the course. This course, now in its second year, physicians with training in documentation and information activities an of great appeal to the students.

The activities of the *Instituto Brasileiro de Bibliografia e Documentaç* in existence for 15 years, are well known and little will be added here. repeat that about 50% of the enquiries met by the IBBD come from IBBD has regional centers at Pará, Ceará, Pernambuco, Minas Ge Paraná, Rio Grande do Sul, and São Paulo, all of which are supposed to c the development of a national union catalog for Brazil. It is also of impo IBBD has a microbiological collection and a reference service.

Two important documentation centers, the *Centro Nacional de Docum* the *Consejo de Rectores*, in Santiago, Chile, and the *Centro de Document* *Consejo Nacional de Investigaciones Científicas y Técnicas*, in Buenos Aires, are not given special emphasis in this paper because medicine is of onl interest in their activities.

Finally, we come to the realm of possibilities, and if they are covere because they seem to be of paramount importance. There has been some di creating a regional library service out of the Gorgas Institute in Panama time the Ministry of Health in Mexico has been interested in the organi National Biomedical Information Center, probably housed close to the larg library in the country (*Centro Médico del Instituto Mexicano del Seguro* co-ordinating all other biomedical libraries in Mexico. This Center, as B São Paulo, should be closely linked with the NLM. To list all the well medical libraries in Latin America and describe their services does not within the scope of this paper.

As a final word, it may be well to say that there is good reason to b medical workers in Latin America are on the threshold of their greatest their coverage by first-rate specialized information services.

problems of medical information systems and centres in developing countries. survey of work in the middle east

L. Arriëns

As I stand here, in my native country, to represent a medical library situated in that part of the world where the oldest traces of medicine are found, I can not refrain from reflecting about Imhotep of Egypt (3000 B.C.) and Aesclepius from Greece (1200 B.C.) who were later deified, Hippocrates (460-377 B.C.) and Galen (130-200) of Greece, Al-Razi (Rhazes) (865-925) and Ibn Sina (Avicenna) (980-1037) of Persia, Ibn Nafis of Syria and Egypt, Maimonides (1135-1204) of Cordova, and all the other famous physicians, giants in the history of medicine and civilization. I wonder what these physicians, on whose knowledge and investigations our present medical science is based, would think if they could hear me giving an account of the present situation of medical libraries in the region where they once lived and worked. I fear they would be greatly disappointed!

Medicine is as old as the human race; long before Christ it was practised in the old civilizations of China, India, Mexico, Peru, Mesopotamia, and Egypt. China influenced India, India influenced Mesopotamia, Mesopotamia and Egypt influenced each other. The Greeks learned from the Egyptians and the Romans from the Greeks. Later, from the Arabian Islamic Empire, extending from Persia to Morocco and Spain, the Arabian physicians learned from the Greeks, the Romans, the Egyptians, the Persians, and the Indians, preserved the heritage of ancient Greece and Rome, added their own knowledge, and transmitted their experience and knowledge to Europe. At the beginning, European medicine learned entirely from Arab sources.

The Western world is also greatly indebted to the Islamic people for astrology, the numerical system, mathematics, pharmacy and medicine, and an enormous amount of literature. We are glad that in this way the Christian world preserved what otherwise would have been lost by the downfall of the Islamic Empire, but we regret that all these sciences did not develop further in the region of their origin.

When the Islamic peoples were invaded by the Turks and ceased to form a unit, bound by the *feu sacré* of a common religion, their great empire fell into scattered pieces, which were not able on their own to compete with the rapid developments of European cultures. The Ottoman Empire did little for the development of their provinces far from the capital Constantinople. Ottoman governors often acted independently, and weakened the central authority.

Europe became worried about the 'sick man of Europe' and was eager to get a piece of that vast empire. Napoleon invaded Egypt in the beginning of the 19th century and had many men of science with him: archaeologists, historians, and others interested in the Near East. He may be considered the first in modern times to introduce modern science into the Arab world.

Italian and French traders were already frequenting the coastal areas of the Near East during the Ottoman regime; now missionaries were also sent. They introduced modern primary, secondary, and university education, including medicine. Thus, t

current was reversed about a century ago: the Arab world started learning modern medicine from the West. The West started paying back its debt to the East.

medical education in the middle east

Much has been written about medicine over the past 5,000 years, and the field of interest in medicine is widening still. More and more sciences related to medicine are added to the study of medicine. This more embracing interest in medicine is also reflected in the book collections of our medical libraries; medical libraries nowadays are completely different from those in the past, not only in their outer appearance, but also with regard to their contents.

During the last 20 years medical education has come into the centre of interest. 'The renaissance in medical education is coincident with the rapid change occurring in society throughout the post-war world' (Wilson, 1967). For the developing countries, medical education is something new. When the former colonies became independent, one of their first concerns was the reorganization of their educational systems. Another concern was the establishment of their national health services. For reasons like the population explosion, social progress, etc., medical education became their special concern, also because of their physician shortage.

As this physician shortage is acute in most of the Middle East countries, it implies that more medical schools are needed for the region, and as the medical library can be considered as an indispensable laboratory during the medical education of the future physician, it also means that more medical libraries are needed for the region.

In March 1967 the Faculties of Medical Sciences and the Medical Alumni of the American University of Beirut organized the Symposium on Education for Health Manpower in the Middle East. One of the statements made at that symposium was that 'the shortage of health manpower overshadowed all other problems of medical education in the Middle East. If the physician/population ratio in the Arab Middle East could be brought to 1/1000, which is considered as a reasonable standard in the developing countries, 50,000 more physicians would be needed for this area. This implies that 15 more medical schools are needed in the Arab Middle East' (Wilson, 1967), and automatically this would mean 15 more medical libraries.

'This is only the manpower situation with regard to physicians. Matters are even more serious in relation to public health specialists, dentists, pharmacists, nurses and various categories of auxiliary health workers' (Wilson, 1967). A curious thing in the developing countries, for instance, is that there are often more physicians than nurses, which is opposite to the situation in Western countries. If we consider that 15 more medical schools are needed for the Arab Middle East, which excludes Turkey and Iran, we can assume that at least 20 more medical schools and a proportional amount of schools of pharmacy, schools of nursing, schools of public health, veterinary schools, and dentistry schools are needed in the entire Middle East, with their connected libraries. Needless to say, a considerable amount of new and well-trained medical librarians are also needed for the future.

It is, however, not so easy to establish all these medical schools all at once, with their medical libraries. In the first place, the economic situation of the countries

hardly allows such heavy expenditures; in the second place, there is a lack of trained personnel. Then there is the fact that the Middle East is not only geographically situated between East and West, but also mentally and spiritually. They do not fully appreciate the Western spirit of efficiency, as the Eastern mind is of a more contemplative nature and more inclined to philosophy about the meaning of the things of life. I will not defend one of the two extremes, as I think a compromise between the two is the better. The Eastern mind could try to seek after more efficiency, while the time wasted in correcting mistakes from hasty decisions the West could spend better on reflecting about human understanding, and especially on understanding humans from other parts of the world.

situation of medical libraries in the middle east

I mentioned before that the Asiatic mind has a philosophical bent. They realize that their system no longer fits the modern way of life, but they are reluctant to change it, as they do not always admire everything that comes from the West, and this is understandable. It is, however, not at all necessary to copy without any change all Western practices for Eastern societies. It is even much more advisable to make Western ideas applicable to the different surroundings and situations where they are wanted. It has already been proved very clearly that Western support was not always the remedy to solve all problems. To let others do the work and sit back yourself has never been a solution. Western support is only temporary, funds are limited, and visiting training specialists are not staying forever.

Let us now look into the possibilities the present situation offers the librarians of the developing countries. They go to the U.S.A. and Europe for their library training. Very well, but what then? The following things can happen:

1. Freshly trained librarians are offered better paid jobs in the U.S.A. and Europe, as there is a shortage of librarians all over the world, so they fail to return to their countries. For that reason their countries are very naturally reluctant to send their best candidates abroad for obtaining degrees.

2. The unmarried library student might find an American or European wife or husband, and for that reason declines to go back to his country. So only the married candidates should be sent abroad, which of course causes other problems.

3. If they return, their governments are so happy with some extra trained and educated members of their society that they offer them positions which have nothing to do with librarianship, but for which they are higher paid than for their library profession. Thus trained librarians are lost for the community as librarians and will in the best cases only support the development of libraries.

4. If a trained librarian comes back and takes up his position as a librarian, he might get very frustrated that in his own country work conditions are much less favourable than in the country where he got his training. A terrible rule, still existing in many libraries in the Middle East, for instance, is that the librarian is held responsible for the loss of books, and the costs of replacements are deducted from his salary. For this reason, free access to the stacks is out of the question. For many other reasons as well, the librarian might leave his job for something better, or go back to the country where he got his training and where he could easily find a library positi

5. A trained librarian comes back to his country and finds so much opposition from his conservative superiors and so little understanding and appreciation for his new and better ideas about library development that he gives up the fight and sinks back to an easy-going level on which he will be left in peace, but of course this improves the situation of his library and the general state of librarianship in his country very little.

6. In the best case, a trained librarian comes back to his country determined to fight against jealousy and to struggle for improvement of his library to the benefit of the institution he works for and to the benefit of his country.

It is, of course, impossible to expect everybody to take the same strong and idealistic pattern as typified by the librarian in the last case. The best solution is to *avoid* the occurrence of cases 1 to 5. Librarians should *not* be sent abroad for their training; they should in the first place have their library training in their own country. Not every country of the Middle East, however, offers enough candidates to make a library school justifiable. The biggest countries like Turkey, Iran, and the U.A.R. have indeed their library schools, although more opportunity for studying specialized librarianship should also exist in their library schools. But for the Asian-Arab countries (Lebanon, Syria, Jordan, Iraq, Saudi-Arabia, Kuwait, Yemen, and the other smaller Arab states on the Arabian Peninsula), however, there still does not exist any recognized library school.

Some library training exists and has existed in Beirut:

1. The Beirut College for Women, an American Presbyterian school, every summer gives an elementary course in English in librarianship during 3 months for girls. Sometimes some men are also allowed to attend this course.

2. During 4 years (1962-1965) the American University of Beirut Library gave a 6-week summer course for elementary librarianship in the English and Arabic languages for students from the Middle East countries, Iran, and Pakistan.

3. In connection with these 6-week summer courses, the A.U.B. Medical Library during 2 years (1964-1965) gave a one-month summer course in medical librarianship for 10 candidates from the same countries, sponsored by WHO. For this course, medical librarians from WHO in Geneva and from the British Council Medical Section in London were sent to Beirut for the teaching.

4. When the A.U.B. stopped its 6-week summer courses, individual on-the-job training of medical librarians from the Arab Middle East, sponsored by the WHO Eastern Mediterranean Regional Office in Alexandria, took place at the A.U.B. Medical Library.

5. In summer 1968 the A.U.B. Library gave a one-month summer course in acquisitions policies for librarians from the Middle East countries, in the English language, and they are planning a similar course in cataloguing for summer 1969.

In Iraq the following training exists: during 6 months per year the Central Library of the University of Baghdad offers a series of lectures on librarianship, practical and theoretical, by a special committee, only open to those with a university degree.

Training for librarianship in Jordan is as follows: summer courses in librarianship conducted by the Ministry of Education; courses conducted by the Jordan Library Association; and in-service training.

And that is all which up till now has been done locally in the field of library training for the Asian-Arab countries.

If one knows the present situation in this region, it is quite obvious that only Beirut, the capital of Lebanon, with its 4 universities (the American University of Beirut, the French Jesuit Université St. Joseph, the Lebanese University, and the Arab University), its 4 colleges (the Armenian Haigazian College, the British Middle East College for boys, the Beirut College for Women, and the Collège Protestant pour jeunes filles), and many secondary schools of rather high standard, would be the chosen place for a solid library school. But, unfortunately, for many reasons this library school has still not been established.

One of the reasons for this is that Lebanon is no longer considered an underdeveloped country which needs much support from an international organization like, for instance, UNESCO. Because of all the foreign capital investments in educational institutions by the U.S.A., the U.K., France, West Germany, Italy, and other countries, it is more or less felt that these institutions should also have the training of librarians on their educational programmes. This is, however, not yet the case, although plans exist for future establishment of a Department of Library Science at the American University of Beirut, and there are even more positive plans for a 9-month Basic Library Training Programme for Library Practitioners, hopefully next year.

Another reason is the vicious circle in which the many untrained librarians of the Middle East region find themselves: because they are untrained, they in this way lack the necessary self-confidence and force of persuasion to convince the higher authorities of their countries of the real need of a training school for librarians, and so their governments are not made aware of this gap in their educational system.

These governments find themselves in another vicious circle: they only want to spend their money initially on projects which will throw off an immediate financial profit. There is, for instance, a very good hotel school in Beirut, set up completely according to Swiss standards. Tourists bring in much foreign money to the country, so the tourists should be attracted by well-run hotels and restaurants. But that a well-trained librarian should be a profitable source of income to the country is not immediately recognized; this is only a vision for the distant future when the country will count many more scholars who care more for the preserver of their intellectual food than for the creator of the diverse delicacies of the kitchen.

A reason which is rather sensitive to be mentioned, but nevertheless is a very real one, is the reluctance for change of the people who are supposed to take action. Everybody is waiting for the other to take the necessary steps, and so the librarians are waiting for the Messiah of the Librarians to stand up and solve all their problems. This Messiah has to fight the same problems everywhere in his neighbourhood, namely, the lack of sense for co-ordination, co-operation, brotherhood, and the lack of harmony and homogeneity between the different interest groups. Everybody is much too ambitious for himself and his own clique and interest group, whether this is

	Medical Libraries in Jordan	*Library establ.*	*Inst. establ.*	*Medical teaching staff* local	foreign	*Students* male	fem.	for.	*Vis (19*
1.	Library, Ministry of Health, Amman	1952							
2.	Nursing College Library, Ministry of Health, Amman	1953							
3.	Army Central Hospital Library, Amman	1962							
4.	Library, Princess Muna Nursing School, Amman	1968							
	Medical Libraries in Syria								
1.	Central Library, University of Damascus. Librarian: Mr. Rifai	1925	1903	70 (Med.) 18 (Pharm.)		1,045 219	131 109	100 25	

Plans exist for a new separate building for the Faculty of Medicine (including the Schools of Mec Pharmacy, Dentistry, & Nursing), with its own med. libr. Books and journals of the School of Me and the School of Pharmacy are still in the Central University Library.
The School of Medicine recently started a small dept. libr. for staff use only, with its own med. lib (Mr. Zuher El-Attar).

2.	Library, Dental Faculty, University of Damascus. Librarian: Miss Nadia Izate	1965	1921	44		261	32	45	

The University of Damascus Medical Faculty originated from the *Syrian Medical Institute*, founc 1901 by the Turks, during World War I transferred to Beirut to the Faculté Française des Pères Jés and closed in 1918. Reopened in 1919 as the *Faculté Arabe de Médecine*, with sections in Phar Dentistry, Nursing and Midwifery. The *Université Syrienne* took the entire Faculty over in 1932, a 1960 the different sections became separate Faculties and Schools from the *Faculty of Medicine* later-called *University of Damascus*.

3.	Medical Faculty Library, University of Aleppo. Librarian: Mr. M. Nidal Istanbuli	1968	1965	4	1	234	23	13	

The Librarian got a 6-mth on-the-job training at the A.U.B. Medical Library in Beirut, and training at the WHO Library in Geneva, under sponsorship of the WHO/EMRO in Alexandria.

Places for readers	*Access to stacks*	*Language of reading material*	*Book-stock*	*Current periodicals*	*Complete vols of periodicals*	*Items lent last year*	*Library budget last year*	*Budget: books & periodicals*
	free	English Arabic French	1,500	25		200		$ 1,400
32	free	English Arabic	1,160	7		500		
40	*free*	*English* Arabic German	*2,000*	*85*				*$ 2,800*
	closed	Arabic English	280	6		8	$ 56	$ 42
300 (for all faculties)	closed	English Arabic French	6,000 (med. & pharm.)	120 (med. & pharm.)		1,500 (for all faculties)		
20	closed	English Arabic	3,000	12	100			
200		English Arabic	2,000	50	100			$ 2,632

	Acquisitions last year Books	Periodicals	*Library staff* prof.	non-prof.	stud. ass.	*Class. system*	*Book catalogues*	*Periodical catalogue*	*Library Comm. members*	*Libra super by*
1.				1		Dewey	Subject, Shelflist	Systematic		Dir. c Labor
2.		5		1		Dewey	Author, Systematic			Princi of Col
3.	60	25		1		Dewey	Author, Title, Subject		5	Dir. of Hospit
4.	200	6		2			Author, Shelflist	Systematic	5	
1.	3,000 (for all faculties)	25	4	21		Dewey	Author, Title, Subject, Shelflist	Alphabetic by title		
2.	150			1		Dewey				Dental Dean
3.	400		2	1		NLM	not yet			Med. Dean

JORDAN

ooks & rriodicals rdered by	*Books & periodicals ordered from*	*Photo-copy service*	*Reprints of med. articles ordered* from	num-ber	*Member-ship in MLA*	*Publications of Institute to which library is related*
ıvision eads and hysicians	Publishers, UN organizations					
lin. of lealth after ıggestions of 'ollege staff	Amer. & Brit. publishers					
:oyal Direc-ɔrate of Med. ervices, after :lection by ibr. Comm.	Amer. & Brit. publishers					

SYRIA

ibrarian n advice f staff	Books: bookshops in Damascus & Beirut Periodicals: publishers	'Devel-op' photo-copying service				
Jniv. ibrarian	Local bookshops					
Fac. Staff hrough Med. Dean	Local bookshops, Gulbenkian Foundation	Verifax in Med. Fac.			yes	

	Medical Libraries in Turkey	*Library establ.*	*Inst. establ.*	*Medical teaching staff* local	foreign	*Students* male	fem.	for.	*Visit last y*
1.	Hacettepe University Library, Ankara. Librarian: Mr. Ilham Kum	1958	1967	165	2	583	546	12	

In 1957 a children's hospital with a book collection was opened at the Ankara Univ. Med. Sc In 1963 a 2nd med. fac. was established at Ankara Univ. under the name *Hacettepe Medical Ce* which took over the pediatrics collection as a start for its Med. Libr. In 1967 the Hac. Med. C became a separate Univ., and the Hac. Med. Libr. dissolved into the Hac. Univ. Libr.

2.	School of Public Health Library, Ministry of Health & Social Assistance, Ankara. Librarian: Miss Ayşen Atlioğlu	1940	1936						33
3.	Central Medical Library, University of Istanbul. Librarian: Mrs. Nazan Haseki	1837	1827	739	1	3,299	724	398	21,24

The Library was established as the Medical and Surgical Military School of the Ottoman Empire. It serves 2 med. faculties of the Istanbul Univ. It has no relation with the 30 dept. libraries belonging t clinics and institutions of the 2 med. faculties.

4.	Library, 'Tevfik Sağlam Özel' Social Nursing College, Istanbul	1955	1943	28			65		

Before 1955 this was the *Anti-tuberculosis Associations' Social Nursing School,* also called the *H Administration Senior School.*

5.	Red Crescent School for Nurses Library, Istanbul	1925	1925	39			196		
6.	Library, Admiral Bristol Hospital School of Nursing, Istanbul	1920	1920	30			50		

Established from a naval base hospital in use during the allied occupation of Istanbul after World W Originally staffed with Red Cross nurses, the institution gave service to many refugees; majorit students were girls from Balkan countries and minority groups. In 1959 reorganized as a Turkish sch

There are 2 library schools in Turkey: one in Ankara and one in Istanbul.
There are 2 library associations in Turkey: a) the Turkish Librarians Association, b) the Librar Association of Istanbul.

'laces or eaders	*Access to stacks*	*Language of reading material*	*Book-stock*	*Current periodicals*	*Complete vols of periodicals*	*Items lent last yr*	*Library budget last year*	*Budget. books, & periodicals*
200	free	English Turkish German French	2,5000 (150 books of historical value)	1,700	22,000	33,330		$ 200,000
50	free	English Turkish French German	4,000 (2,000 pamphlets)	162	2,000	466		
400	free	Turkish English French German	14,880	748 + 175 free subs	18,957	28,500	$ 65,000	$ 35,000
	free	Turkish French English, German	300	3				
	free	Turkish English	1,666 (25 books of historical value)	15				
12	free	Turkish English	740	2				$ 100

	Acquisitions last year: Books	Periodicals	Library staff: prof.	non-prof.	stud. ass.	Class. system	Book catalogues	Periodical catalogue	Library Comm. members	Librarian supervised by
1.	4,464 +296 gifts	450	15	14		NLM	Dictionary	Alphabetic on title		Univ. Pres.

The Librarian keeps close contacts with the NLM in Bethesda, the WHO Library in Geneva, and the Downstate Medical Center Library in New York.

	Acquisitions last year: Books	Periodicals	Library staff: prof.	non-prof.	stud. ass.	Class. system	Book catalogues	Periodical catalogue	Library Comm. members	Librarian supervised by
2.	16	3	2	2	2	Barnard	Dictionary Shelflist	Alphabetic on title		Dir. of School
3.	900	28	1	10	2	NLM	Dictionary incl. journal titles, Shelflist		5	Med. Dean
4.	10				1	Subject class.	Author, Title, Subject			Dir. of School
5.	45	3			1	Subject class.	Author, Title, Subject			Dir. of School
6.	24			3 part-time	1	Dewey	Shelflist Books are alphabetically arranged			Dir. of Hosp.

The Library Education Section of the Faculty of Letters at the *Ankara University* was established in 1955 with the help of Ford Foundation and with American teachers. The 4-yr course has no foreign teachers anymore. During the first 2 yrs students are obliged to take courses in other sections of the Faculty of Letters.

Books & periodicals ordered by	*Books & periodicals ordered from*	*Photocopy service*	*Reprints of med. articles ordered* from	number	*Membership in MLA*	*Publications of Institute to which library is related*
Suggestions of med. staff & students through Librarian	Faxon, Max Hueber, McGraw-Hill, Local bookshops	Apeco	Authors	474	yes	*Turkish Journal on Pediat rics* (in English) *Cocuk Sağiği ve Hastali klari* (in Turkish) *Hacettepe Tip/Cerrahi Bülteni* (in Turkish)
Board Directors through Librarian	Tarhan Kitabevi, Ankara					Books & reports in Englisl & Turkish *Quarterly Index* to period icals on public health
Med. Librarian	Max Hueber, Harrassowitz, Local bookshops	Verifax	NLM, Science Museum, London	650 11	yes	*Medical Bulletin* (semi annual) *Istanbul Universites Tip Fakultesi Mecmuas* (quarterly)
Dir. of School	Local bookshops					
Dir. of School						
Dir. of School	Mosby, Macmillan, McGraw-Hill, *Amer. J. Nursing*, Turkish Min. Health					

the family group, the social group, the religious group, or the political party to which he belongs. All these private interests dominate the individual more than anything else, absorb all his world of thoughts, and hardly any thinking is left for what might be the best for all and everybody. One is thus very egocentrically and groupcentrically adjusted in the Middle East. This has to be changed into a more broadminded view of life in order to gain the spirit to serve the community and not only oneself.

For this special reason, which is not meant as harsh criticism but only as a plea for a better future for our libraries in the Middle East, I would ask all my colleagues in the Middle East for a strong and courageous conception of life, for a certain stubbornness to push through what they have in mind and to convince those who hesitate to support them, in order to shape libraries in their countries to the standards necessary to serve their community. Only when a strong will is present can one succeed, and then foreign aid will not be wasted nor lost when it is discontinued, but it will remain like seed sown in a fertile ground from where it will grow and bloom into something long and perhaps even everlasting.

suggestion for improvement

Let us now be down-to-earth practical and see what a determined medical librarian can do in case he gets his library degree abroad (in Europe or the U.S.A.), returns to his country in the Middle East, and is assigned, for instance, the responsibility of the library of the medical faculty of a university. Above all, he should realize that he has a more important and responsible task than many other medical librarians in his country. Hospital libraries, pharmacy libraries, nursing school libraries, public health libraries, dentistry libraries, veterinary libraries, and all other kinds of smaller medical libraries will more or less depend on: the larger collection of his library; his authority and experience in medical librarianship; and his personal relations with library organizations and medical libraries abroad.

having a positive open mind to the problem

Librarians, and especially librarians in the developing countries, still have to fight very hard for their recognition. As a librarian in Indonesia 20 years ago, I personally encountered the thought that an office boy could do my job as well, and this concept is still more or less in vogue in many countries where libraries are a rather new and unknown phenomenon.

When a new medical faculty is established, the medical library forms the last item on the agenda and budget; it is the place where the rest of the money goes to, if any money is left over! Quite often medical books and journals are only available in the general collection of the university library, where they can also be used by the other faculties, till the need for a special collection in near reach of the medical faculty and medical students becomes so urgent that a haphazard provision and accommodation has to be created, perhaps in a spare room which was useless for other purposes.

Nevertheless, an inventive and enthusiastic librarian can be able to create

something out of nothing: we have seen touching examples of this. No librarian should ever be discouraged by difficult and poor circumstances. He should have a fresh and open mind, be gifted with an enormous practical common sense, be as curious and daring as an explorer in an unknown field, and unabatedly looking forward as a pioneer in a new country — his country, after all. As a pilgrim he has to set before his eyes the ideal he wants to achieve, and he has to use all his organizational talent in thinking out how he can achieve what he wants with the limited means given to him. He should not sink in bitter thoughts when he does not immediately succeed, and reflect about the perfect and beautifully accommodated libraries he saw in Europe or the U.S.A. He should take for granted that he perhaps will *never* reach in his own short lifetime what in the Western countries was achieved after centuries of experience; he should only try to make the best out of it, be proud and happy for the progress he doubtless will make, and hope that his successors will continue his work in the same spirit and will do it even better. With this positive attitude in mind, he will be constantly amazed by how much he will be able to achieve, what before seemed so impossible and out of reach. This mentality is not taught in schools; it is only taught by life itself.

For one thing, however, I have to warn every librarian who wants to make changes for the improvement of his library. He should not change everything too soon, too quickly, and too entirely. This upsets and irritates the people he has to deal with and, besides, it causes too many unexpected difficulties and consequences. He should use his eyes in the beginning very well, but he should start by taking over the library as it is running, and change things slowly and gradually, in order to get his staff, visitors, and superiors used to it. Many things which might seem odd in the beginning might very well have their good reasons for existence. The new librarian creates confusion if he later has to change things back again to the old situation, after having introduced reforms in the beginning too rapidly in his over-enthusiasm.

convincing superiors of the importance of a good medical library

Modern librarians are lively human beings and no longer represent the [illegible] dusty ones from the past, who, anxiously guarding their books, [illegible] moles in their holes and whom they resembled at the end, [illegible] like dry paper. It might be, however, that in the developing countries [illegible] of librarians still exists in the imagination of the people, [illegible] noticed how rarely people from the developing countries [illegible] homes, I doubt any concept of libraries in their minds. [illegible] missionary task in order to change this situation.

Medical libraries in the developing countries [illegible] in their special subject of medical science; [illegible] rely on, nor any public library up to Western [illegible] the medical field. However, often in the [illegible] libraries of the U.S. Information Service [illegible] the needs of a well-provided public library, [illegible] entering the universities this is not enough. [illegible] still do not sufficiently realize the [illegible]

universities. It is like inviting many people to your house and not having seats enough for them to sit on, nor food enough to offer them. Realistically, the universities often do not have enough places for their students to sit, and the intellectual food, supposed to be provided by the libraries, is far from sufficient.

Absorbed as they are, in the first place, by organizing their teaching programmes, the universities most neglect provisions for the library. The librarian has to care and to be concerned about this, but as it is very difficult for him to convince the whole faculty on his own, he can only raise their interest through a library committee, whose members should all be faculty department heads. The next consequence of having more reading material is the problem of having enough library staff to handle this material. The bigger a library becomes, the more management and organization is needed, and this cannot be performed by untrained librarians, or by librarians with not enough experience in library management and library development.

We now come very near to closing the vicious circle: as there are in the developing countries not yet enough public libraries to make the people interested in libraries, the money will in the last place be spent on libraries, so the libraries will remain poor and underdeveloped, badly housed, equipped and manned, and will never become very popular in the eyes of the people. Then the only thing a librarian can do is to come out of the ivory tower in which his predecessors were living and make his library more popular with the public, and when his library is not a very brilliant one to attract attention, he has to start to make himself popular!

Nowadays librarians have to advertise for themselves and for their profession in order to obtain recognition. They have to make good personal contacts with the people who have a say in the management of the library. A medical librarian should always try to draw the attention of the medical dean, the medical faculty department heads, and all the faculty members to the needs and shortcomings of the medical library. He should take a positive attitude to complaints, not trying to excuse them and to escape from them, or to deny shortcomings of the library when complaints are felt as a personal insult. He should take advantage of each occasion when a complaint is raised to point out to the complainer that he is indeed right, but also that his help is needed to change the situation for the better. Sadly enough, the librarian will often experience that the heaviest complainers will usually be of least constructive support to the library! But he will undoubtedly also find ones who will wholeheartedly and actively help him.

It is most important for the medical librarian to have a lively and pleasant contact with the members of the medical library committee; if there is no such committee, he should convince the dean to establish one, consisting of the most influential people of the medical faculty, and the people with a real interest in the library. A medical librarian is often not a medical doctor, so only the medical faculty members have close contact with the medical dean, or other person responsible for the library.

On the other hand, the medical librarian has to take care that members of the medical library committee are not misusing their position on the committee for their own benefit and for getting special privileges in the use of the library, or are becoming meddlesome in minor library routines and so becoming a nuisance to the librarian. If the librarian, who always has to be a politician at the same time, can manage to

keep the committee at a certain distance from his own daily management, and at the same time can make good use of their relationship with the medical dean and other higher authorities, then his library can only profit from it.

giving moral support and help to subordinates and colleagues

A medical librarian in a developing country should not only defend his library and his own position against the ignorance and misunderstanding of the people he has to deal with, but he also has to defend others against this ignorance. He has to protect, advise, and encourage his subordinates and his colleagues in librarianship and medical librarianship who are in a less fortunate position than he. He might be one of the few professional librarians in his country; he might even be the only one. He should realize his moral responsibility to help the others and not take the negative attitude of thinking: 'Let them find out for themselves'. This way of thinking is often born out of the fear that the pupil might become better than the master; a strong master, however, knows that he is not improving his reputation as a good teacher by hiding his skill and not sharing his knowledge with others. A well-trained medical librarian should educate his subordinates as much as is possible in the field of librarianship to which they are assigned. It will improve the service of the library, and nobody will be so ignorant as not to observe that the library is doing better. Only in this way will recognition of the skill of the librarian be born.

A broadminded librarian should also freely give advice to his colleagues of smaller medical libraries, often in a more isolated position than he. He should liberate them from the seclusion they are working in by making personal contacts with them. He should offer them on-the-job training, without any charge; he should even try to convince their superiors that a long period of such training is necessary. These superiors should also realize that librarians need to have a full-time job, and not be part-time librarians and part-time fulfilling another secretarial or office job. The more such a librarian does his best to help his colleagues, the more his help and advice will be sought and the more his authority will be recognized.

encouraging library education and forming library organizations in one's own country: keeping contacts with libraries and library organizations abroad

The best way for a librarian in the developing countries to convince his countrymen that library training is not on the same level as training an office boy in a few weeks or a clerk in a few months is by putting his efforts into:

1. Establishing a library school in his country;
2. Establishing and encouraging a national library organization;
3. Keeping contacts with the medical librarians and the national library organizations in nearby countries; and
4. Keeping contacts with international library organizations and especially with international medical library organizations, who all will definitely be more than willing and interested in helping him as much as they can. What a single person cannot achieve might be achieved in union, mutual understanding, co-operation, and co-ordination with his fellow librarians who all face the same problems, and who all will be happy to help an enthusiastic, hardworking, and loyal colleague.

special suggestions to non-professional medical librarians

After having dwelt upon the possibilities for a professional librarian to improve his library and the situation of librarianship in general in his country, the question may arise as to what the greater number of non-professional medical librarians could do in the same case.

For them, the same as said before for the professional librarians applies, although their problems are much more complicated and the barriers more difficult to overcome, as they enjoy less recognition of their profession than their degreed colleagues. For them, it is specially necessary to be supported by a library committee, but as they probably might not even know what to ask that committee to do for the library, I would advise them strongly, in the first place, to convince their superiors that a library training is very essential for them, preferably in their own country if there is a library school, but abroad if there is not.

Library training abroad, however, is not easy to achieve:

It will be difficult for the candidate to get accepted at a library school in the U.S.A. or Europe. For gaining acceptance at a foreign library school, the candidate should realize that a good knowledge of the teaching language of the school concerned is of primary importance. Then he has to find out what library schools accept foreign students. Information about foreign library schools he can get from: cultural attachés of prospective host countries; professional librarians in his country; professional librarians in a nearby country; the American Library Association in Chicago; and the Medical Library Association in Chicago.

Funds for travel, tuition fees, books, board and lodging, etc., might not be available for the candidate. If the candidate cannot get funds from his own institution for study abroad, he can try to obtain scholarships from: his own government; foreign embassy representatives in his country; international library organizations; and those library schools which give scholarships or reductions to students from the developing countries.

The institution for which the candidate is working might not want to miss him for a year or more. In case the candidate cannot succeed in convincing his superiors that for a thorough library training at least one year is necessary, he can ask the help and advice of other library authorities: a professional librarian in his country; a professional (medical) librarian from a nearby country; or the WHO Eastern Mediterranean Regional Office in Alexandria, U.A.R. Several times candidates sponsored by the WHO/EMRO were sent for some months on-the-job training to the Medical Library of the American University in Beirut. Of course, this is not an ideal training and no diploma or certificate is granted after this period, but it is better than nothing. The candidate at least will practise in a fairly good medical library, he will meet other librarians and see other libraries in Beirut, and make personal contacts which will be useful to him in the future.

In general, I would say that every medical librarian in the Middle East, whether professional or not, can always count on help, advice, moral and practical support from the WHO/EMRO in Alexandria and from his colleagues in the Middle East countries.

Finally, I would like to end by saying that I realize that there actually is much

more to say about this matter, but as I am limited in my speaking time, I hereby have to end. What in my opinion, after 7 years of experience in medical librarianship in the Middle East, was the most urgent thing to stress, I have said.

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problems of medical information systems and centres in developing countries. survey of work in africa

S. O. Falayi

Medical information systems and centres in the developing countries of Africa face numerous problems. Many of these problems differ in variety and in magnitude from those experienced in the developed countries of the world. No mechanization or computerization has been reported in the medical information systems of these countries; the medical libraries there still depend upon the conventional manual system of keeping records and of seeking and giving out information. Whereas the trend in the developed countries is towards the establishment of *medical information centres*, the emphasis in the developing countries of Africa is still on the traditional *medical libraries* which give out information in addition to the organization of books for the use of their clientele. Therefore, most of the problems discussed in this paper are those of medical libraries.

problems of medical information systems

Medical information systems in developing countries are deprived of the speed, accuracy, and other advantages of mechanization and computerization, which as already stated above have not been introduced into these countries.

Some commercial houses, industrial firms, and government departments have, however, installed computers in those business concerns which yield direct monetary gains, and these computers are used mainly in such simple processes as the calculation of wages. Most of the commercial and industrial firms are of foreign origin, and they depend upon their home countries for any information they may need, and do not sink further financial resources into the development of information centres in the developing countries. On their side, the governments of the developing countries are very poor and tend to give priority to the development of those services that give direct monetary returns. Unfortunately, medical libraries do not fall within this category, and therefore, governments would be reluctant to finance any project of library computerization.

Consequently, medical libraries in the developing countries of Africa have to make do with the manual information system. Even then, this system is not without its own problems.

problems of medical libraries

The problems facing medical libraries in the developing countries are many, and can be grouped into eight main headings, namely:

1. Funds
2. Library personnel
3. Building accommodation

4. Organizational structures
5. Acquisition of library materials
6. Inter-library co-operation
7. Book preservation
8. Professional associations

funds

Lack of funds is the major problem facing medical libraries in the developing countries of Africa. It is true that medical libraries the world over are faced with financial problems, but the financial problems in Africa are of dimensions unknown in the developed countries.

Most of these developing countries, which gained political independence less than ten years ago, are still extremely poor. In many of these countries, agriculture is still to be mechanized, industrialization, if any, is in its very early stages, and their vast mineral resources still have to be tapped to the maximum. Public services of all kinds have to be developed almost from scratch, except in the few cases where their erstwhile masters left anything. Developing countries have therefore had to spread very slender financial resources over numerous national economic projects and public services. The result is that these young nations have been compelled to choose and decide their priorities of development.

In most cases, immediate financial returns have been the guidelines in deciding priorities. The establishment of hospitals, medical schools, and medical libraries does not bring in direct monetary returns to the governments concerned, and these, therefore, have not been classified among priority projects. Consequently, many of these countries have no medical schools, no medical libraries, very few hospitals, and few doctors in relation to the population. Some years back, the ratio of doctors to inhabitants was about 1 : 100,000; now it is about 1 : 40,000. Certainly, without an adequate number of doctors, the growth of medical libraries could not be stimulated.

Another factor which delays the establishment of an adequate number of libraries is the attitude of the public and the government towards the establishment of libraries. At the time of independence, the majority of the population in each of the countries was illiterate; some of the parliamentarians who took over from the colonial masters only had elementary education; some of the government executives who had to initiate development programmes, though literate, did not attach much importance to libraries. Therefore, the establishment of medical libraries, or any forms of libraries, was not included in the national development programmes of these states.

The cumulative effect of the foregoing is that, of about 30 developing countries, South of the Sahara, there are less than 20 medical schools. Similarly, there are very few medical libraries.

In concluding this section, it may be necessary to mention that many of the other problems discussed below stem off from this cardinal problem of lack of funds.

library personnel

There is an acute shortage of experienced library personnel. The late start of development was obviously the primary cause of this shortage. When there were no

libraries, people did not consider taking up librarianship as a career because of lack of employment prospects.

Poor conditions of service are also responsible for the shortage of personnel. Coupled with these is the inadequate provision of local library schools. In all the developing countries of Africa, there are only six library schools, a number that can in no way meet the manpower needs of these countries. Unfortunately, the number of students going to overseas library schools is very limited because most of the private students prefer the more lucrative professions, whilst the number of government scholarships awarded in librarianship is very limited.

Within the last three years, there has been a vast increase in the number of qualified librarians who have graduated from the local and overseas library schools. Unfortunately, there is no proportional increase in the number of libraries that could absorb those newly qualified librarians. There is therefore the danger that the personnel situation, which has started to improve, may deteriorate into the former position, as unemployment may start to scare away prospective candidates.

As a result of the facts mentioned above, medical libraries in Africa are unable to secure the services of experienced librarians locally. And for various reasons, these libraries are unable to secure the services of experienced expatriate medical librarians.

building accommodation

Again, owing to lack of funds, most of the medical libraries are poorly housed. Shelving accommodation is so often grossly inadequate that it is always a big problem to find shelving space for each of the volumes added to the library.

The problem is not only of lack of space, but also of unsuitable accommodation. Sometimes accommodation is provided in temporary prefabricated buildings, with leaking roofs, and sometimes in stores with inadequate ventilation. Such libraries are unsuitable for reading purposes, and valuable books and journals are usually exposed to destruction by rain, insects, worms, and moulds.

organizational structures

In many of the developing countries, medical libraries are often not made separate departments of parent organizations, but are lumped up with unrelated departments or departmental sections for the purpose of administration, with a non-librarian as head of that department or section. This is the case with most of the medical libraries attached to the government ministries of health.

The condition is slightly different in the case of the university. Here it is usually a power struggle between the university librarian and the university medical librarian, and this usually has adverse effects on the development and use of the university medical school libraries.

acquisition of library materials

The acquisition of medical library materials in Africa poses many problems. These include lack of funds, foreign exchange difficulties, and long delay in the receipt of books.

Lack of funds. Owing to slender financial resources, horizontal development of public services, and the relatively low value placed upon library services, the medical libraries of the developing countries of Africa, particularly those attached to government departments, are often allocated such a tight budget that they cannot afford to acquire an optimum size of bookstock and bibliographic tools, and to employ adequate staff to cope with the various stages of acquisition work. It is not unusual to see many of the government central medical libraries having an annual budget of less than £5,000 for staffing, acquisition of books, serials, pamphlets, photocopies, etc., and for binding.

Foreign exchange difficulties. Developing countries have made many stringent foreign exchange control regulations in order to preserve their monetary reserves in other countries. It is therefore not always easy to ship money out of the country and to pay for the books and periodicals ordered from foreign countries. As a result, many overseas book agents and publishers have refused to sell, on account, books to libraries in these developing countries.

The rate of foreign exchange also constitutes another acquisition problem. In many instances, the rate of currency exchange with some of the foreign countries is so unfavourable to the developing countries that it will be too expensive for medical libraries in these countries to acquire books directly from those foreign countries.

Long delay in the receipt of books and periodicals ordered. For the acquisition of books and periodicals, medical libraries depend upon publishers in far-away Europe and America, from which the transportation of the bulk of books to Africa has to be by sea. The use of air routes for regular book transportation is ruled out because of prohibitive costs. Books and periodicals ordered therefore take an average of 3 to 6 months — obviously a long period — to arrive. There is no alternative to this long delay, since most developing countries lack their own publishing houses or local branches of overseas medical book publishers. Worse than the long delay, publishers' announcements sometimes reach African medical libraries very late and items ordered may therefore not even be supplied because they are either out-of-print or out-of-stock by the time orders reach book agents and publishers.

Other aspects of the acquisition problem are lack of efficient and experienced local book agents, forwarding and shipping difficulties, poor internal postal services, lack of experienced and efficient local clearing agents, and the unwillingness of overseas book agents to modify their transaction systems in view of the long distances and shipping hazards involved.

Inter-library co-operation

Inter-library co-operation is fundamental to the success of library service for, by it, individual libraries can maximize their resources. Unfortunately, there are many factors which work against inter-library co-operation in Africa.

The absence of adequate and effective means of communication, both at the national and international levels, is one of the major factors hampering the development of inter-library co-operation in Africa. Isolated from America and Europe by great oceans, and separated from one another by vast deserts and dense forests that discourage linkage by road and rail, most of the developing countries of Africa not

only lack national telex and efficient postal and telephone systems, but are also not linked by telex or telephone with one another.

For inter-library co-operation to be of mutual benefit to the libraries in a given area, the sum total of all their resources must represent a good percentage of the subject areas covered by the libraries. Unfortunately, in the developing countries of Africa, there are very few medical libraries, each with meagre resources. Such inter-library co-operation as even exists is usually a one-way affair in which the larger library is always lending to the smaller and poorer library.

Inter-library co-operation in the developing countries of Africa is further hampered by the language barrier which exists between English- and French-speaking countries. This language problem is rendered more difficult by the absence of translation services. Photocopying facilities are also inadequate.

book preservation

Most of the African developing countries are in the tropics, and it is very difficult to preserve books in the tropics because of the presence of moulds, worms, insects, heat, and humidity.

Mr. W. J. Plumbe (1964) has dealt expertly with this problem in his book on book preservation in the tropics. One may only mention here that air-conditioning has been considered useful in protecting library materials against heat and humidity. Chemicals used for fighting worms and insects have not proved 100% successful, and it must be noted that the chemicals, too, are capable of causing deterioration of paper.

Bookbinding may be mentioned here. The following are the main binding problems:

There are very few local private bookbinders. Even the few in most cases lack adequate training and experience in the art, and owing to lack of funds, prefer to run small-scale one-man businesses, and often without adequate tools. Consequently, these binders are unable to cope with the volume of work available, let alone produce any work of good standard.

Most government printing departments undertake binding for the other government departments, including government medical libraries. But it takes too long — sometimes over 6 to 9 months — to deliver completed work. Government medical libraries are thus discouraged from patronizing the government printing departments.

Some of the universities have set up binderies of their own, but, unfortunately, they do not take outside jobs.

Some of the commercial presses undertake binding, but in some cases their workmanship is as poor as that of the local private bookbinders. In other cases, their charges are so exorbitant that it is impossible for local libraries to patronize such presses.

The cumulative effect of the above is that most of the medical libraries in the developing countries of Africa find it extremely difficult to have their journals bound. Moreover, it is not practicable for them to send their journals overseas for binding, and it is not within their means to set up their own individual binderies.

professional associations

One of the major problems here is that national library associations are not virile enough to foster the image of the library profession. Young, poor, and ineffective, they fail to provide the rallying force that should bring librarians together for concerted efforts in tackling the many problems facing libraries. If national library associations are weak, medical library associations or medical sections of national associations are non-existent.

work already done in connection with the solution of the problems

Before putting forward proposals, it would be quite useful to outline what has already been done towards the solution of these problems. Since most of the problems stem from lack of funds, the governments and medical libraries of the developing countries have not been able to do much in solving these problems. The governments have made some money available for the establishment of medical libraries and library schools and for the award of scholarships in librarianship. But the amounts voted were usually too small to produce any noticeable results. The medical libraries themselves could not achieve much, mainly because of the negative government attitude towards library development.

Some assistance has been received from the governments, foundations, institutions, and individual medical libraries of the developed countries. The following are only a few examples:

The Rockefeller Foundation of New York sent a medical library expert to Nigeria in 1963 to survey the medical library resources and to make recommendations for reorganization. As a result of the recommendations, another expert went to Nigeria in 1964 and compiled a union list of biomedical serials in Nigeria.

The United States Agency for International Development made a grant available to Ibadan University in Nigeria for the erection of a building for a medical sub-library.

The United States Medical Library Association granted a Travelling Fellowship to a medical librarian from Ghana in 1961 and one to a medical librarian from Nigeria in 1962.

The Smithsonian Institution of the United States has paid for the cost of shipping large quantities of duplicate materials from the U.S.A. to medical libraries of the developing countries of Africa.

The United States Information Service has made many valuable donations of books to medical libraries in Africa.

The United Kingdom Government has made substantial grants to some of her former colonial territories in Africa for the establishment of universities. Attached to some of these universities are medical schools with libraries.

The British Council, Ciba Foundation, British Medical Association, and some other British organizations have made valuable contributions through the donation of either new books or periodical subscriptions to medical libraries in various parts of the developing countries of Africa.

The West German Government has offered to train a Nigerian medical librarian in library computerization.

Individual medical libraries in the U.S.A. have donated large quantities of back

numbers of journals to various medical libraries in Africa. The NLM sends pl copies of periodical articles, free of charge, to various medical libraries throug Africa. In addition, it has undertaken MEDLARS bibliographic searches for libraries.

The above list of aids is by no means exhaustive. Unfortunately, time and will not permit complete coverage. It is even obvious that those countries that hav yet made any contributions to the development of medical library service in A would have been willing to do so if they had known the true picture of things a they had been approached. An appeal is therefore now presented to those cou through the forum of this august assembly.

It is true that some aid has been given to African medical libraries by the go ments and agencies of the developed countries, but, unfortunately, what has given is too small in comparison with what is yet to be achieved in medical l development in Africa. How the developed countries can meet the obligations upon them by nature in respect of medical library development in the wo covered under the proposals outlined below.

proposals for the solution of problems

This paper will not be complete if concrete proposals are not put forward f solution of at least some of the problems enumerated above. Owing to limitati space and time, the suggested proposals cannot be exhaustive but selective. solutions are implied in the discussions of the problems. The following, then, a major proposals.

aid from the developed countries

One of the fundamental natural instincts existing in the world is the tend the strong to *help* the weak. Happily and fortunately, the developed countries world have clearly demonstrated by their deeds that they wish to help the dev nations. It is fortunate because such an action will help to facilitate the devel of these less developed nations, so that they can take their proper place in th monwealth of Nations and make their own contributions towards intern co-operation. Such a situation will reduce bitterness, suspicions, prejudic wars, and the world will become a happier place to live in. In the light of the it is not an exaggeration to say that the developed countries owe it as a humanity to help the underdeveloped ones in any way possible.

The developed countries have given aid amounting to millions of pour most of this has been for the development of roads, bridges, dams, water supp but not much has been given for the development of libraries and, particul medical libraries. But the time has now come when aid should be given on scale and on a more organized pattern for the development of medical librar following are some of the patterns that could be adopted:

Role of the World Health Organization. This world body has spent mil pounds in assisting the developing countries of Africa in the eradication of smallpox, etc., and in setting up various committees to advise these countries

health problems. Medical libraries are essential to the administration of these various health programmes. It is therefore suggested that WHO should play a leading role in the development of medical libraries in Africa just as its counterpart, UNESCO, has done in the development of school and public libraries. The following are suggested areas where WHO could offer aid:

1. Establishment of national libraries of medicine.
2. Establishment of medical libraries in the principal hospitals.
3. Assisting the development of university medical school libraries.
4. Development of library computerization.
5. Organization of fellowships in medical librarianship.
6. Employment of professionally qualified nationals of the developing countries on the staff of the WHO Library in Geneva.

These could form long-term projects, and if WHO does not possess the necessary funds, it could approach foundations and governments of the developed countries.

Role of the governments of the developed countries. Aid from the developed countries to the developing ones is usually negotiated on a government-to-government basis. However, it is unfortunate that some of the governments of the developing countries would rather like to ask for aid for the development of roads, electricity, and water supplies than for library development. So it is not always possible that medical libraries in developing countries can succeed in making their governments ask for aid for their libraries.

It has been suggested above that WHO could approach these governments on behalf of the medical libraries of the developing countries. In addition to this, further approaches could be made by the national libraries of medicine and other principal medical libraries of the developed countries after receiving requests from medical libraries of the developing countries. Provision of buildings and such capital equipment as microfilm readers, photocopying machines, library computers, etc., are among the aids that could be anticipated.

Role of individual medical libraries of the developed countries. It is recommended that each medical library of the developed countries should adopt, as a 'baby child', a medical library in the developing countries. It should attempt to assist that library in any way possible. Assistance could take any of the following forms:

1. Donation of *new* books and of back numbers of journals, or help for the young library to secure donation of such materials.

2. Where the young library requires an assistance involving heavy expenditure, the older library should urge its home government to meet such a request.

3. Development of personnel exchange programmes where members of staff from the developed countries would work for short periods in the medical libraries of the developing countries for the purpose of re-organizing those libraries and for training their members of staff. It should also be made possible for members of staff from developing countries to work in the medical libraries of the developed countries for the purpose of gaining more practical experience.

organizational structures

There are two categories of medical libraries in the developing countries of Africa, namely, libraries attached to government medical institutions and university medical school libraries.

Organization of government medical libraries. A start should be made to establish medical libraries in the principal government hospitals in each country. These libraries should be made separate departments or sections of parent organizations and should be organized on a *regional basis.* If the largest administrative unit in the country is a state or province, all the government medical libraries in that state or province should be formed into a system where there is a large central medical library in the capital city and there are branch medical libraries all over the state or province. Requests that cannot be met at the branches should be sent to the central library for processing.

Organization of medical school libraries. These should be organized on the lines recommended by the U.S. Medical Library Association.

library computerization

Foundations and governments of the developed countries should be urged by medical libraries in those countries to help to finance library computerization projects in the developing countries as well as the training of personnel in this kind of information system.

Everyone is aware of the tremendous success achieved by MEDLARS of the NLM. This Library has started to establish MEDLARS sub-stations in the U.S.A. and Europe. The developing countries of Africa should not be left out in this programme. As soon as there is sufficient advance in library computerization in Africa, the NLM should establish MEDLARS sub-stations in the main regions of Africa for the deposit of magnetic tapes.

publishers and booksellers

Medical booksellers in the developed countries should be invited to open branches in the regions of Africa. Publishers should also open branches, so that medical books published in America and Europe can be published simultaneously in Africa. These, of course, should be long-term projects and should only be adopted when sufficient numbers of medical libraries have been established in Africa. It is only then that it can be economical for such firms to operate bookselling and publishing there.

professional associations

The following are recommended for the re-organization of the national library associations:

1. The associations should find the funds with which to establish paid secretariats. Membership drives may assist in strengthening the finances of the associations.

2. They should seek government recognition so as to be able to effectively advise the government on library development. In this connection, a supreme library council should be set up.

3. They should compile and maintain government-recognized registers of qualified librarians.

4. They should seek the authority to certify training programmes in the local library schools.

5. They should organize committees for the purpose of studying and recommending solutions to problems facing local libraries. The following are among the areas that should be examined by the committees: book preservation, inter-library co-operation, book binding, and photocopying.

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medical libraries in developing countries

C. F. Reynolds

In recent years there has been a growing interest in medical libraries in developing countries because of the number of new medical schools that are being started and the desire to upgrade the existing ones. However, there is a dearth of information on the problems of these libraries that can be used by agencies and educators to formulate policies for their planning and improvement. It is desired, therefore, to highlight some of these problems and suggest a method for coping more successfully with them.

The foremost problem in any country usually relates to finances, but it is particularly acute in developing countries. We will make a mistake, however, if we attempt to equate their needs and capabilities with the accepted standards in other countries.

Let us take the U.S.A. as an example where much consideration has been given to standards for medical libraries. Over six years ago it was stated that a minimum of 100,000 volumes and the current receipt of 1,500 journals was necessary to support the research and teaching program of a good medical school (Bloomquist, 1963). At the same time, it was reported that some new medical schools had allotted $500,000 to build the basic collection and provided over $100,000 in the annual operating budget (Brandon, 1964).

In a recent study (Bryant, 1970) made of the budgets of four medical schools in developing countries in different parts of the world, it was found that the budgets ranged from $600,000 to $1,570,000. All of these institutions were receiving support from U.S. foundations; some received substantial sums. These were compared by the same author to the budgets of two theoretical schools in the U.S.A.: one with 256 students had a budget of $3,400,000, the other with 384 students had $4,100,000. If we can assume that 5% of the total budgets of these institutions were used for library purposes, we would have from $30,000 to $78,500 in the developing countries compared to $170,000 to $205,000 in the U.S.A. Without the foundation support the disparity would be much greater.

It must be recognized that costs vary in different parts of the world. Salaries, binding, and some other expenses are likely to be lower in developing countries, whereas the price of books and journals will be higher because of the postage. There are many good medical schools in Europe, for example, where I am sure the budgets are no more than half of the theoretical budgets mentioned above. It has been demonstrated that 300 journals will supply over 80% of the requests for journal articles in a medical library (Fleming and Kilgour, 1964), which is only 1/5 of the number considered necessary above. These figures would indicate that it is necessary for libraries in developing countries to operate on a much smaller budget than is considered optimum in the U.S.A., and that in some areas this need not result in a major reduction in effectiveness.

Equally pressing are the problems relating to staff. Developing countries have urgent needs for college-trained personnel in all departments of the government, in professions such as medicine and engineering, and in private business (Deale, 1966).

This makes it difficult to recruit capable persons for library positions and able students to library schools, because the salaries and prestige of library positions are not sufficiently high to be competitive. Usually there is a small core of able and devoted persons who have studied abroad that provides what leadership there is in the library profession. Because there are so few of these individuals, they cannot form an effective professional organization.

A very serious obstacle to the growth and recognition of libraries is the failure of the students and faculty to make use of the library collection, and this has been observed in many countries. One author (Srivastava, 1965) stated that the average Indian university student studies less than one hour a day outside the classroom, whereas the U.S. student would spend at least 20 hours per week. Another study (White, 1965) indicated that the average Delhi University student used about eight books during an academic year compared to 60 to 70 by the average American undergraduate as reported by Branscomb in 1940. A similar condition applies in Turkey: great emphasis is placed on memorizing the textbook, and collateral readings are almost never given (Asheim, 1966).

It is even more deplorable to find that the faculty do not make much use of the central library. In part this is due to the custom of having departmental libraries where they may consult their own small collections However, there are at least two other factors. Salaries are so low in many developing countries that faculty members must supplement their income with other positions, so there is literally no time for use of the library. Also, there is a reluctance to use the library because this would be an indication that the faculty member did not know everything about his subject that he should know.

It should be mentioned that one of the main reasons for students to come to the library is to borrow textbooks. One author (Villela, 1968) in his comments on teaching biochemistry in Burma stated that few students can afford to buy the medical textbooks, so the libraries provide duplicate copies, which, of course, depletes the book budget. This is true in most developing countries, but fortunately in some countries the medical schools now purchase the texts and rent them to the students, so they are no longer procured with library funds.

There is no area where the problems are less familiar than in the daily operations of a library. Librarians in the more economically advanced countries are fortunate that the majority of their books and journals and most of their supplies come from their own country or nearby countries. If they have not visited or, even better, lived in a developing country, they have not seen the complexities that are encountered there. Let us examine just a few of these.

One of the most obvious difficulties is the matter of distance from the source of supply, whether it be from the U.S.A., the U.K., France, etc. One must wait longer for material to arrive and, in the case of journals, when claims are made for issues not received, they may already be out of print.

There are problems in almost every phase of the library's operations. The lack of funds prohibits the acquisition of all the bibliographic and reference tools the good medical libraries will have. The absence of these will slow up the searching processes in the acquisitions, cataloging, and reference departments and make it i[illegible]ible

locate some desired information. The recommended lists of books and journals that have been published are useful, but not precisely what the library in a developing country needs.

We should not overlook the complications that are encountered with binding. We are accustomed in the U.S.A. to collect a volume for binding and, if it is complete, our responsibility ends there, after the initial basic instructions are in the hands of the binder. In contrast, here the journal must be prepared exactly the way it is to be bound, making sure that the advertisements are removed, all pages are in order, the index, title page, supplements, etc., are in place. To some this may appear to be routine, but any serials librarian can tell you this is not necessarily true, because of the inconsistencies in page numbering of supplements, indexes, title pages, and advertising. Then too, the binding must be carefully checked when it is returned, to see if the journals were properly bound.

One great asset that medical librarians in the U.S.A. have is the ability to procure some issues of journals for little or no cost to fill the gaps in their collections. They may come through the exchange program of the MLA, the U.S. Book Exchange, from a professor who received journals through a society membership or on a grant, or in a number of other ways. These sources are not so readily available to the libraries in other countries for financial reasons.

There are great inconveniences involved in the purchase of supplies. Catalog cards that meet ALA standards, pamphlet binders, and mending supplies are usually not available in developing countries, so they must be ordered long in advance and in larger quantities. Such items as book ends and file boxes for journals can often be obtained locally if an enterprising artisan can be found to copy a model.

Interlibrary loans can be a serious problem. Short journal articles can be obtained free and in good time from the U.S. NLM* and for a moderate fee from libraries in other countries. Books are difficult or impossible to obtain because of the danger of loss or damage in the mails. Libraries are even reluctant or unwilling to send books through the mail to other libraries in the same country.

How can we improve the conditions under which these libraries operate? How can we provide better trained personnel and the opportunity for them to continue their education and development? How can we provide information, services, and counseling for libraries that need it? There are no easy solutions because distance must be overcome by faster communication, libraries must achieve greater recognition as an integral part of the education process, and the economic structure strengthened to permit substantially larger sums to be allotted for library purposes.

One method by which this complex situation can be approached is the development of a regional medical library that would serve an entire region. This system is evolving now in the U.S.A. under the aegis of the NLM, and a regional library has been established in Brazil under the sponsorship of PAHO. I do not know what is envisioned for the regional library in South America, but it is my belief that such a library must be far more than just a large collection of medical literature from which

* Free interlibrary loan service to foreign countries was discontinued in September 1969 due to budget cuts.

the smaller libraries may borrow materials. It should exercise leadership in the region so that through self-help and co-operation the most can be made out of their present resources. In addition, the regional library can provide assistance with modern technologic innovations: photocopying of articles, centralized cataloging, literature searching, etc. Let me be more specific on the services and type of organization that I propose.

The library should be located near the geographical center of the area to be served and where there are good communication facilities and mail services. There are some advantages to having it based on an existing library that is and will continue to receive strong support, but it must be sponsored by an international organization or other agency that can provide the financial support that will be required. The collection should compare with good biomedical libraries in the U.S.A., but with an emphasis on the collection and utilization of the journals, books, reports, etc., in the broad areas of the health professions that pertain to the region being served. It is proposed that the following services can be provided or considered:

The provision of essentially the same *interlibrary loans* service as given by the NLM, namely, free microfilm or photocopy to participating members. A liberal loan policy for books is also desirable if procedures can be adopted that will insure safe delivery.

Full cataloging for most books on a cost basis if it is desired by the participating libraries. Presumably, most of the books ordered by the medical libraries in the region will already have been cataloged by the regional library so it would only involve copying a set of cards. All libraries should be encouraged to utilize this service because the catalogs and other permanent records are often woefully inadequate. This would also insure greater uniformity in records, that will in turn permit easier co-operation.

For *ordering books and journals*, the provision of a clearing house for information relating to the purchase of books and journals, as many of the libraries will have limited bibliographic resources. If there is a desire for a central purchasing agency, this should be discussed with the other librarians.

The provision of an *inventory of supplies* that must be ordered from another country, such as pamphlet binders and catalog cards.

For *literature searching*, the provision of reference services and the preparation of bibliographies within the capabilities of the staff. The center would act as intermediary with the NLM if a MEDLARS search seemed desirable.

The provision of *translation services* at cost.

The provision of an *advisory service* when needed on any phase of a library's program. It is also recommended that each participating library be visited once every year or two by the director to establish close relations between the component libraries and to encourage the maintenance of standards in each library. While these services would be available when requested by each library or medical school, where a new library is contemplated it is hoped that any foundation or international organization planning to give assistance to the library or school would find it highly desirable to consult the staff of the regional library before making decisions on such assistance.

The publication and distribution of a *newsletter* to provide the information that appears in various library publications and elsewhere that may be of interest to them. It would include news events, summaries of important articles, and descriptions of new techniques and equipment.

The provision of a *training program* for the personnel of the participating libraries or persons sponsored by them who are preparing for positions in those libraries. A few scholarships should be provided each year so that personnel of a high quality can be attracted to these positions.

The publication of *library manuals* and other guidebooks which focus on the problems of the region, the functioning of the regional organization, and the member libraries.

Periodic *meetings* of staff members from the participating libraries to permit the exchange of ideas, and to enable them to become better acquainted with one another.

The success of this proposal is, of course, dependent upon the willingness and ability of nations to co-operate with one another in this joint enterprise. In Southeast Asia, the area that I know best, there have been several co-operative ventures of an economic and educational nature with varying degrees of success. The idea still persists, however, that it is only through joint efforts that these countries, or developing countries anywhere, can hope to solve some of their common concerns. The costs of medical education and research are tremendous, and the burden is heavy for even the most affluent countries. Unusual efforts and new procedures are necessary if the developing countries are to achieve their goals.

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development of medical library resources and services in pakistan

Z. Ahmed

The utilization of national resources with a view to encouraging better health for the people of Pakistan has been a significant event of the post-Independence decades. A remarkable improvement has been made in the field of medicine, since we started almost from scratch. At the time of Independence only three medical colleges and one dental college were within the territories that now constitute Pakistan. Bold steps had to be taken to solve the formidable problems of health care of the millions of people by establishing new medical colleges and up-grading the already existing medical schools. Eleven colleges were in operation by 1958, and 20 by 1968 (Table I).

Table I. *List of institutions.*

Postgraduate
1. Jinnah Postgraduate Medical Centre, Karachi
2. Institute of Postgraduate Medicine, Dacca
3. School of Tropical Medicine and Public Health, Dacca
4. Institute of Chest Diseases, Dacca
5. Institute of Hygiene and Preventive Medicine, Lahore

Undergraduate
1. King Edward Medical College, Lahore
2. Dow Medical College, Karachi
3. Khyber Medical College, Peshawar
4. Nishtar Medical College, Multan
5. Fatima Jinnah Medical College (for women), Lahore
6. Liaquat Medical College, Hydrabad
7. Dacca Medical College, Dacca
8. Salimullah Medical College, Dacca
9. Rajshahi Medical College, Rajshahi
10. Chittagang Medical College, Chittagang
11. Sylhet Medical College, Sylhet
12. Mymensingh Medical College, Mymensingh
13. Barisal Medical College (opened in November 1968), Barisal

Dental
1. De Montmorency Dental College, Lahore
2. Dacca Dental College, Dacca

The special feature of the development during the last decade was the establishment of four postgraduate institutions with modern research facilities. This trend reveals that the country laid strees not only on the crying need of the health care of its vast population, but also on the solution of another equally important problem, *i.e.*, postgraduate education and research in order to keep abreast with its own peculiar health problems from within the resources available locally. Until 1959 we had to bank entirely upon some foreign countries for higher training of our doctors at the cost of national wealth in foreign exchange. To review the results of this trend today, we feel happy to note that the number of doctors produced was 19,425 by the end of 1968 as against only 9,614 in 1958 and 1,225 at the time of Independence. This rise in

the number of doctors has brought the physician-population ratio to 1 : 9,600, though still lower than the desired. There were 16,942 hospital beds in 1948, which rose to 25,406 by 1958 and 35,224 last year. The medical centres do have libraries of their own. But to one's utter surprise, improvement of these libraries remained continuously ignored. The book collections and their organization are in a lamentable state. The closed shelves are filled with old and worn-out books and incomplete and unbound backlogs of journals. The libraries have hand-written catalogues and use DC and *Sears List* for classification and assignment of subject headings, except in one post-graduate institute which maintains a typed catalogue and uses LC schedules and subject headings for classification of books. The collections vary from relative insignificance in the fairly younger institutions to the approximately 20,000 volumes held by the oldest institution in the country. With the exception of one institute, none of the colleges provide separate buildings to house their libraries. The working hours of the libraries are also very short, except the one in a postgraduate centre which remains open from 7:30 A.M. to 10:00 P.M. At present, the 20 medical institutions employ a total of 29 professional and non-professional library staff; the largest number employed in one library is eight, and the lowest nil. The average number of staff is 1½. The Medical Reforms Commission in its survey report rightly observed, 'We have found the library facilities in our medical colleges with few notable exceptions, to be deplorable, not only through a deficiency of books and periodicals but also the inadequate reading accommodation provided for students and the staff. It would seem to us that financial stringencies apart, there has been lack of drive and initiative to make the best use of the available resources' (Pakistan. Ministry of Health, 1960).

Speaking on the importance of the medical library, the Commission commented, 'No library of the size required by a medical college can serve the needs of its staff and students unless a trained full-time librarian is in charge'. The Commission also recommended 'the establishment of two central libraries on the pattern of that of the Royal Society of Medicine, one in East and one in West Pakistan' and thorough interlibrary loans, and perparation of a union catalogue of the holdings of the college libraries. In the perspective of the profound changes in the field of medical education, research, and patient care, and the resultant increase in the volume of pertinent literature, the responsibility of the individual library to provide access to that part of its collection which is relevant to the use of the clientele has greatly increased. A library that can offer an intelligent and sophisticated leadership with its qualified personnel is the one that can keep up with the needs of its users also. The library and its functions are interwoven into the basic fabric of research, teaching, and practice of medicine.

financial support

While most institutes associated with medical research, medical education, and medical care have made spectacular advances in recent years, the libraries attached to these institutions have failed to keep up with the progress made. Adequate funds to which most of this growth may be attributed have not been available for libraries.

Assailed by many forces — scientific, economic, etc. — the medical libraries are in serious disrepair, resulting in considerable inefficiency to the health programmes. Programmes of quality research have been impaired by the growing inability of scientists to gain quick and efficient access to the medical information they need. Teachers and students get hampered in their educational pursuits affecting their academic standards. Of direct and most immediate importance to the health of a nation is the urgent need of medical practitioners of ready access to the growing bulk of new knowledge. Inefficiency in the medical library network has created an insidious ignorance which neither science nor practice of medicine can condone. It has been resulting in unplanned and unnecessary duplication of research efforts. It has also been postponing the application of advanced knowledge vital to the alleviation of human suffering. The inadequate library system has acted as brakes upon the entire progress of national health programmes. The adverse effects of poorly supported libraries have been realized by our physicians and scientists who now, as never before, strongly claim library support.

the library community

There are 20 libraries all over the country associated with educational institutions in the fields of medicine and dentistry. About 30 other medical libraries attached to the research institutes, laboratories, societies, etc., have not been included in this paper. These 20 libraries have been serving a total of approximately 8,000 students and faculty members. These libraries represent a variety of specialization, function, size, and condition. They serve three common purposes: the advancement of health knowledge, the advancement of health education, and the improvement of health practice. They, therefore, deserve particular attention.

From this community have grown multiple inter-relationships, so much so that this community may be thought of as a more or less integrated network. The libraries can lend and borrow from each other in order to supplement their resources to a greater extent than any other library group. The dedication of medical librarians to voluntary co-operation can set examples for other librarians for the improvement of services. A *de facto* pattern of the two central library systems as regional centres, as recommended by the Medical Reforms Commission, can be created in order to constitute the nuclei of medical library networks in both wings of the country with minimum resources as forms of voluntary co-operation. The role of the proposed centre can be entrusted to the libraries attached to two leading postgraduate institutes situated in two wings of the country which are, and will be, growing faster than any other existing libraries. Through its record of interdependence, the medical library community, including the non-teaching sector, can develop informally a well-knit service apparatus. Through their development of the representative collections of published medical literature, these libraries can demonstrate their abilities to improve the methodology and efficiency of the library network.

service

The expansion of libraries and volume of services to the community of users have remained handicapped not only by inadequacy of funds but also by a lack of adequate provision for service itself. The *basic requirements of service* as laid down in the 'Guidelines for medical school libraries' (1965) are: effective communication between the administration, the faculty, the medical staff, and the librarian: the administration should inform the library staff of its objectives, and make them familiar with the organization and structure of the medical community; the library must maintain contact with its users in order to be aware of their needs; and the staff should be sufficient in size and competence to plan and carry out the service programme of the library.

Bibliographic and reference services range from the verification of a simple reference to comprehensive and evaluative searches of literature pertaining to a particular subject. The activities of a library in this respect will depend on many factors, including the demand for these kinds of services, the support, and the personnel available. The medical school library, as an information laboratory, should communicate knowledge to further the purpose of the instructional programmes and the programmes in research and patient care. It will require, in addition to the necessary resources, necessary information specialists to help readers in the utilization of the resources. The library should keep the users informed of what is being added to its collection through bulletins, exhibits, personal communications, etc. It should undertake literature searches, though the users should be encouraged to help themselves in this regard. This kind of activity requires staff members with adequate training and experience of conducting literature searches. The staff should also provide verification of bibliographic citations for manuscripts being prepared for publication. It is desirable that library staff members should be able to help in translation of literature in some of the important foreign languages. Records of the library collections and their location information should be readily available. The library should interpret its policy regarding services, scope of collection, and principles of operation to the users. It should offer brief courses of librarianship to the patrons to enable them to work independently in order to exploit knowledge relevant to their interests.

A significant cause of the inadequacy of our national medical libraries is *resources*, the small number of books and journals on their shelves. The average collection in each library is approximately 3,500, which is far below the requirement. The journals that form the core of the collections are not being subscribed to regularly. The highest number of medical journals subscribed to by a library is 300, and the lowest, 10 (the library associated with the youngest college has yet to subscribe to journals). The improper utilization of the meagre funds that are made available is a superadded factor. The reasons behind this improper utilization are: the absence of the know-how of selection and acquisition methods among the librarians; and a lack of interest among the heads of the institutions in building the library resources. Deficiencies in library resources strike deep at the heart of the national interest and effort in the field of health sciences, for they limit the medical library users in obtaining information they need, either in connection with on-going research or clinical work in medicine, or in the initiation of new projects.

Assistance to medical libraries in developing the resources they need should be an integral part of the support of the authorities. Glowing tributes are due to the WHO for its financial support extended to our medical libraries in building resources. It has been providing funds separately for each medical school for purchase of books and journals of choice. Though their support will continue for another period of two years in addition to the one year that has already passed, the impact of this substantial support to our medical libraries will go a long way in the development of our library resources.

All library materials should be made available for use by the patrons within the library, and provision should be made for their use outside the library through photocopies and microfilms. The loan regulation should ensure maximum use of the materials that can be made available. Materials not available in the collection should be produced from other libraries on interlibrary loans. For this, a knowledge of the resources available with other libraries is required. With regard to the library building, it should be suitable for efficient operations and must have a congenial atmosphere within it that should attract the users. Hours of service should meet the requirements of the majority of library users. Records of periodical holdings should be kept up to date and should be easily available for consultation by the readers

Library materials should be arranged for *easy access* and utilization. The *classification scheme used should be able to accommodate the changing needs of the* library users. The cataloguing system should be convenient. Materials should be catalogued and ready for use without unnecessary delay.

The *selection and acquisition programme* should be organized with a view to adding the adequate number of volumes, in multiple copies if necessary, to meet the requirements of the clientele. Systematic search should be made by the staff concerned to select the right material at the right time for the right reader. There should be a minimum gap of time between the selection of materials and placing orders. Sources should be established for gifts and exchange of materials, such as the MLA Exchange Program. A close watch of bibliographic developments in various subjects involved in the institution's programme should be maintained.

library personnel

With regard to the manpower presently available, the 20 medical institutions employ 11 professional and 18 non-professional librarians, whereas their total requirement is 75 professional and 125 non-professional personnel (Table II). The

Table II. *Present position of manpower in the libraries and their total needs.*

Type of institution	Number of institutions	Present position		Further requirement		Total requirement	
		Prof.	Non-prof.	Prof.	Non-prof.	Prof.	Non-prof.
Postgraduate	5	7	7	23	43	30	50
Undergraduate	13	4	9	35	56	39	65
Dental	2	0	2	6	8	6	10
Total	20	11	18	64	107	75	

largest number employed in one library is 8 (both professional and non-profes
the smallest, nil. The immediate requirement of an additional 64 and 107 prof
and non-professional staff, respectively, calls for serious attention. Looke
perspective of the growth rate of the medical schools, the increasing bulk of r
and the growing number of practitioners, it is obvious that this shortage will
more acute with the passage of time. There is need for specialists in medica
mation other than librarians, such as indexers, abstractors, and translators, a
need will continue to grow.

There is thus the problem not only of quantity, but also of quality. It is
that medical research and education in this country is dependent upon such
pool of 29 librarians, including the unqualified ones. Even more painful is th
paid to professional as well as non-professional librarians, which is not wort
tioning here. Scarcity of job opportunities in the field of medical librariansh
poor salary scales are deterrents for making careers in this field.

The *professional staff* should have degrees qualifying them to utilize profe
knowledge of organizing and managing information from recognized sch
library science. Some professional members should have subject background
biomedical sciences or training in biomedical libraries. Personnel trained in the
management of audio-visual materials is also desirable. Persons appointed to
visory positions must possess administrative ability.

As outlined in the 'Guidelines' (1965), the *chief librarian* must have, in a
to his professional competence: knowledge of scientific literature and n
enabling him to understand the goals of the library users; knowledge of the le
processes; creative power to develop new programmes and to carry them ou
a good personality. The *other staff* members should possess training specific t
jobs. The non-professional members should have knowledge of types of
work carried out in the library.

The determination of the *size of staff* depends on: the age of the librar
experience of financial and other support; the quality of management in the pa
number of the clientele it serves and the nature of their work; the quality of
offered by the library; and the growth rate of the collection. The ratio of profe
to non-professional staff, as experience suggests, should be 1 : 2, being higher
larger libraries and lower in the smaller ones. Salaries for the positions sho
commensurate with the responsibilities and background required for the jo
should be in line with other positions at a similar level in the medical school. Th
librarian should be assigned faculty rank (Guidelines, 1965).

Provision of continuing education to qualified and non-qualified staff sho
given to improve their training or to fill gaps in their knowledge, provide
knowledge helps the development of librarianship.

As for the development of medical library education in the country, none
professional library schools has yet come up with any provision to offer cou
medical librarianship and medical information sciences to equip the existing m
libraries. This is due to the lack of qualified teachers on the regular strength of th
ulties of library science who could develop curricula to cater to the needs of m
libraries. There is, therefore, a need that knowledgeable teachers be provided to

Table III. *Manpower needs of individual libraries of various types of institutions.*

Positions	Quantity	
Postgraduate libraries		
Chief librarian	1	
Deputy librarian	1	
Assistant librarian	4	
Library assistant	10	
Total	16	
Undergraduate libraries		
Chief librarian	1	
Assistant librarian	2	
Library assistant	5	
Total	8	
Dental libraries:		
Chief librarian	1	
Assistant librarian	2	
Library assistant	5	
Total	8	
Manpower needs of postgraduate libraries: 5 × 16		80
Manpower needs of undergraduate libraries: 13 × 8		104
Manpower needs of dental libraries: 2 × 8		16
Total need		200

the library schools. Attention should be diverted to training for research and teaching, as well as for service. As for the support of the trainees, the governments and the philanthropic foundations should award scholarships to or depute those who are non-qualified and are engaged in libraries and to fresh scholars who are willing to pursue careers in medical librarianship. This will create incentive to the talents of the society who are in a position to provide leadership in the field. With the emergence of the medical libraries as an important ingredient, the librarian must be able to assume leadership in the administration of a functioning organization which will undoubtedly develop the dimensions and status of a department of the medical school. His department must develop a research and teaching capability as well as provide a comprehensive service to biomedical users. It is essential that these leaders in the medical library field possess the capability for planning and designing future medical library information and its communication network. In this context, grateful thanks are due to the WHO once again for their magnanimous support in offering fellowships to provide training to some of our working medical librarians.

A vigorous attempt must be made to provide grants to assist the construction of new medical libraries, renovation of existing facilities, training grants exclusively designed to attract and develop professional medical librarians and other information specialists in order to remedy critical manpower deficiencies, and grants to enable medical libraries to strengthen their collections.

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deficiencies in the latin american systems of medical information

C. A. Sosa Gallardo and M. F. Terenzi de Peretti

Among the numerous problems confronting the medical libraries of South America, one of the most serious is, without question, the lack of sources of information which record scientific work published in the various Latin American countries. This is reflected in the small proportion of the work which appears in indexes. As Sabor (1966) points out, the infrequency with which material is indexed is responsible for a dearth of national information and for corresponding defects in bibliographic services. She says: 'In the present state of the bibliographic services of Latin America, those services which collect, regardless of subject or quality, the output of the continent as a whole carry the largest share of responsibility for recording that of each country. One of the defects of the library system is the irregularity and incompleteness of its bibliographic services.'

A glance at the two reference works most in demand in all parts of the world, *Index Medicus* and *Excerpta Medica*, reveals the paucity of entries for Latin America (without more exact localization) as compared with those for other countries. This deficiency was confirmed by a comparative study of the contents of *Index Medicus* for the last 50 years, which gave the results shown in Fig. 1.

These data clearly show the unsatisfactory position of the developing countries of Latin America, particularly of Argentina, since their entries were more numerous 30 years ago than they are now; which means that scientific material published in South America in 1940 was better publicized and therefore better represented than that published in 1968. This depressing conclusion induced us to study more deeply the material included in our national publications and to seek to identify the defects which are principally responsible for its incomplete character, reference sources, periodical publications, or authors of articles.

reference sources

Our study began with reference sources, and we immediately realized the absence of a complete register of our scientific material. This deficiency, most obvious in developing countries, is chiefly due to lack of communication between the countries of South America.

periodical publications

In general, periodical publications are financed by pharmaceutical firms, which will supply funds for the provision of information but have no interest in the strictly scientific aspect. Proof of this is found in the unsatisfactory character of many of the publications. For instance, *Tribuna Médica*, one of the most recently founded South American periodicals, can hardly be classed as a source of information, since its articles are without bibliographies and some have no summary in English. For pub

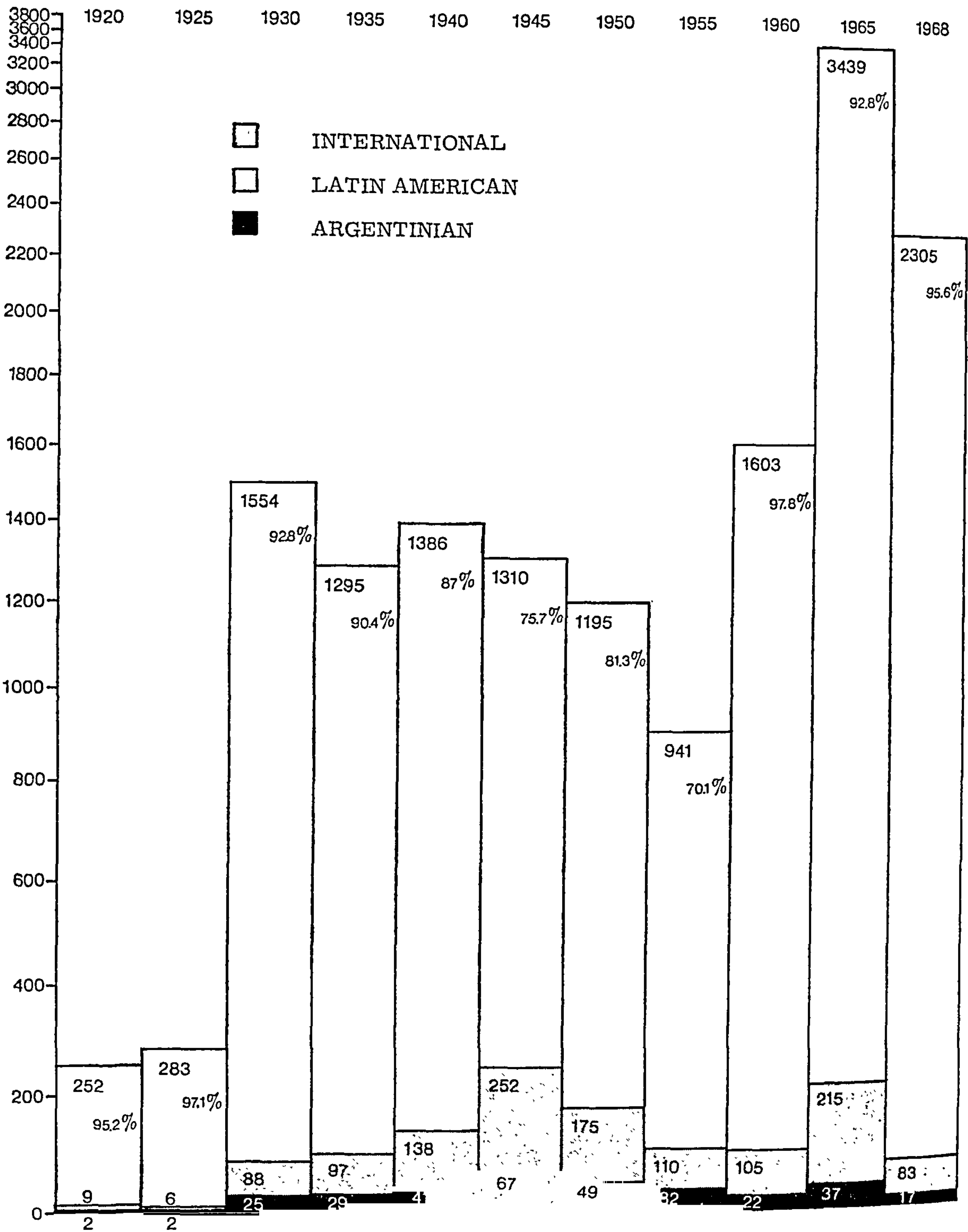


Fig. 1. Relative contents of *Index Medicus* 1920-1968.

reasons, large numbers of the articles published (mainly reports of clinical cases or of current events) have bibliographies which are incomplete or ill-balanced.

It would be well if standards were established to which all publications were obliged to conform, and if editorial committees of all journals were to insist that every article submitted must be adequately documented by its bibliography.

authors of articles

We come now to the root of the trouble: the authors. The first requirement is *training*: as student, as graduate, and as investigator.

As a student: he must be taught how to define a subject and orientate his studies accordingly. This can and should be done by means of suitably planned courses, annual and compulsory, of practical work. In these courses he will learn not only bibliographic methods but also the value of periodicals as a medium of advancing knowledge; they will form the future author and familiarize him with current scientific work (Terenzi de Peretti, 1969). The Buenos Aires Faculty of Medicine Library (Director, Dr. Hernandez) has been giving such courses for authors and students for the last six years.

As a graduate: he must learn to standardize his material and to quote titles of journals in the accepted form. Improvement of the information services should insure that they cover all existing material and that we in South America are not deprived of our own.

As an investigator: in our own country no great problem is presented by the full-time research worker, since we have the National Council for Scientific and Technological Research, which supplies the material required for any particular investigation. On the other hand, the professional worker who wishes to undertake clinical or surgical investigation often experiences such difficulty in locating the necessary information that he abandons his project. When he needs references, he is obliged to rely on foreign bibliographic publications, which unfortunately contain no information about many of the investigations of fundamental importance undertaken in our own country; particularly those concerned with regional pathology (*e.g.*, virosis hemorrhagica).

An attempt should therefore be made to centralize national bibliographic information and to integrate it with the international material. Certain institutions are serving this purpose, co-operating in an interregional scheme designed to collect and co-ordinate the total material available in each region. The Library of the Faculty of Medicine of Buenos Aires has for some time been carrying out this task, and Córdoba is engaged in compiling an Argentine medical index (Terenzi de Peretti, 1968).

We must strive to set in order our national bibliographic material, which, if properly documented, will give us a means of communication with scientists in other countries and enable us to make better use of our own resources. It should never be possible to say with truth that our research work is impeded by lack of information.

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medical information in the argentine republic

H. H. Hernández

It is generally realized that society is passing through a period of unprecedented change and entering the so-called post-civilized or technological era. New developments are taking place in every sphere — psychological, economic, scientific and technical — of human activity, and techniques of learning and behavior are changing with ever-increasing rapidity, the result, in Oppenheimer's words, of a 'change in the *tempo of change itself*' (Juarroz, 1970).

The Latin American countries, Argentina in particular, are engaged in a drastic reorganization of their health services designed to adapt them to this age of dynamic change and to solve the problems of finance and higher education springing from the loss of traditional benefactors and the evolution of increasingly elaborate medical techniques. There are three fundamental problems:

1. The training of doctors competent to work in a changing social environment full of unpredictable possibilities. The curriculum must be planned accordingly, emphasizing the importance of scientific knowledge and the value of the medical library as a source of information, especially when the student has some command of foreign languages.
2. The training of teachers competent to instruct the budding doctor not only in the traditional doctrines but in the new. The teacher has to keep abreast of advancing knowledge, synthesize it, and transmit it to the rising generations, and must have the vision to see the future as full of hopeful promise.
3. The great problem of co-ordinating the health services with the needs of the society which they exist to serve. The health services form an intricate network which not only includes doctors but receives increasingly large contributions from many other disciplines. Modern medicine is linked with anthropology, sociology, economics, statistical methods, political theory, etc., and all medical research requires the participation of workers in other fields. Co-operation depends upon adequate information and effective intercommunication.

It has been said that 'Medicine and health are phenomena of society, not something alien to it' (Robertson, 1968). Medical education, therefore, should accord as closely as possible with the state of health of the population.

The doctor today is in a difficult position. He is a member of a society, and he also belongs to a community in which matters of health are the concern of many other professions, of teachers and students and indeed of society as a whole; health, then, is no longer the concern of doctors alone. In this complex system in which medicine, technology, and other disciplines connected with public health are equally involved, adequate information is no less indispensable than in the field of medicine proper. It is the only sound basis of plans for organization or expansion of health services in developing countries, and many schemes have failed because they were based on information which was either inadequate or so slow in reaching the hands of the planners that it was of no use when received.

We have shown that there are three fundamental problems and will now show

in what measure the national resources of medical information have contributed to their solution in Argentina.

This country is one of those in which the ratio of doctors to population is relatively high. According to the latest figures, there is one doctor to each 660 inhabitants.

During the last few years those responsible for planning, organization, and control of the health services have come to realize the necessity of having at their disposal a quick and efficient means of obtaining biomedical information. Because of the growing demand from governmental as well as from private quarters, old-established sources of information are being reorganized and new ones set up as documentation and information centers or services.

The vast territory of the Republic has been organized by the national universities into regions, which vary in size according to the characteristics and needs of each, and which include various institutes for higher education. The medical field is served by seven large state medical faculties, each covering a wide and characteristic area of the country. The oldest of these faculties is that of the University of Buenos Aires, which has the largest number of students and the most extensive medical library in the country. The Central Region is covered by the Medical Faculty of the University of Córdoba; the Argentine Littoral by the Faculty of Medical Sciences of the National University of Rosario; the North-Eastern Region by the Faculty of Medicine at Corrientes; the Northern Region by the Faculty of Medicine at Tucumán; the Western Region by the Faculty of Medicine of Mendoza at Cuyo, and the Southern Region by the Faculty of Medicine of the University of La Plata. In addition to these, there are two medical faculties attached to independent universities, the University of Salvador at Buenos Aires and the Catholic University of Córdoba.

Table I. *Bibliographic material in the medical libraries of the national universities.*

University	Date of Foundation	Books: volumes	Periodicals: titles	Periodicals: volumes	Total volumes
Buenos Aires	1863	525,529	7,349	100,512	626,041
Rosario	1922	37,625	2,387	32,719	70,344
Córdoba	1884	12,000	1,278	23,000	35,000
Cuyo	1950	10,265	529	17,720	27,985
Corrientes	1953	3,200	270	2,700	5,900
Tucumán	1962	6,300	565	2,760	9,060
La Plata	1897	15,100	818	8,500	23,600
Total		610,019	13,196	187,911	797,930

The national faculties possess the most important libraries in their respective zones (Table 1). These libraries are organized in such a way as to give priority to teachers and students, to research workers in specified institutions, and to general medical readers, whose requests are dealt with in that order. Despite deficiencies of material or of borrowing facilities which exist in many of the libraries, there is no doubt that they are doing their best to provide more or less up-to-date information relating to the biomedical sciences.

There are also the libraries belonging to professional associations, etc. Firms manufacturing chemical products almost all possess small libraries of selected material required by their own staff, and in some cases these libraries contribute to the diffusion of information by supplying inquirers with copies of material in their possession or borrowed from the university libraries or other sources.

At the present time documentation and information centers and services connected with medical institutions are in the process of formation in certain provinces, *e.g.*, Santa Fe and the Avellaneda province of Buenos Aires. Their functions are to undertake bibliographic research in the large libraries, such as that of the University of Buenos Aires, and to make relevant material available to individual clients, either through a system of interlibrary lending or by production of xerographic facsimiles.

Co-ordination of the information services is effected in the following manner: A union list of the scientific and technological periodicals available in Argentina, indicating the libraries in which they are to be found (Argentina, Consejo Nacional, 1962), was published by the National Council for Scientific and Technological Research. The medico-biomedical section was compiled by 34 co-operating libraries. The Council has recently directed its Scientific Documentation Center to prepare a revised list of periodicals, including new ones now available, with a view to publication of a new union list.

The Argentine Association of Scientific and Technological Libraries and Information Centers has at each of its conferences (the last held at Santa Fe, June 18-20, 1968) discussed the problems of co-ordination of regional library facilities and rationalization of acquisition of periodicals. By comparing the medical periodicals in the union list with the lists published in *Index Medicus* and *Biological Abstracts*, the Association has ascertained which medical journals are not received in Argentina, and is holding further meetings to discuss arrangements whereby libraries in selected regions of the country would begin to receive these periodicals within a specified period. This would insure that coverage was complete and that in the future the largest possible number of medical journals (as a minimum, those listed in *Index Medicus* and other important indexes) would be available in Argentina. Another piece of work undertaken by the Association is the preparation of a national union catalog of reference books and other sources of bibliographic information (including those already indexed in the Scientific Documentation Center of the National Council for Scientific and Technological Research), such as reports of conferences, symposia, etc. This catalog, in conjunction with the union list of periodical publications, will provide a source of reference which should secure fuller co-operation in the information services.

The medical libraries of the national universities are represented by their regional library committees on the Committee of Argentine National University Libraries. The terms of reference of this Committee are: to promote and co-ordinate the work of the national libraries, and to co-operate in a consultative and advisory capacity with university authorities. The Committee has considered the problems associated with administrative control of the acquisition of books and periodicals. A study has been made of the present position in the university libraries and of means whereby plans for the future development of the national libraries may be integrated with similar plans for higher education. A proposal has been made that separate biblio-

graphies should be compiled for all faculties, designed, first, to provide students with a basic bibliography of books and periodicals, and second, to co-ordinate the supply of basic educational material to the various medical faculties of the country.

the bibliographic problem

The Library of the Faculty of Medicine of the University of Buenos Aires, anticipating the need for a national medical bibliography, has prepared a card index of all relevant material (books, articles, etc.) available in Argentina, with a view to early publication. It was thought convenient to co-ordinate publication with that of bibliographies of other sciences and technologies, and for this purpose a subcommittee for scientific bibliography was formed at the Scientific Documentation Center, its terms of reference being: to study the possibility and methods of preparing such a bibliography, and to supervize its eventual publication. A national bibliography was considered necessary because of the difficulty in tracing much of the Argentine literature appearing in periodical publications, of which only a part is to be found in the international indexes. For example, the list of journals given in *Index Medicus* 1968 contains only 16 entries for Argentina, omitting considerably more than half of the medical periodicals published in the country and many with a large circulation among the Argentine doctors. *Biological Abstracts* 1967 listed 130 Argentine periodicals under **biology and medicine.**

A virtually complete bibliography of Argentine odonto-stomatological literature is published in the *Indice de la literatura dental periódica en castellano y portugués* which first appeared in 1950. The latest issue (1966) was compiled by the Indexing Committee of the Argentine Odontological Association and includes an index of journals published in Latin America, Spain, and Portugal.

Another publication which deserves special mention, because it includes literature translated from other languages into Spanish, is the *Bibliografía médica en lengua española 1960-1965* (1967) with a supplement covering 1966-1967, compiled by the Franklin Inter-American Foundation for Library Studies with the help of a grant from the W. K. Kellogg Foundation. The main work contains 5,331 entries, the supplement 2,125; *i.e.*, a total of 7,456 entries for the period 1960-1967. It was decided to produce this bibliography, first, because no similar publication had appeared and, second, because Spanish translations of important works in other languages can perform a useful service in areas where the language barrier is a serious obstacle to dissemination of medical knowledge, and may stimulate future production of translated literature in these areas. Argentina possesses some excellent medical authors whose works, in translation, are standard educational texts in various parts of the world; the standards of translation, illustration, and production are high.

We have shown that (for anyone unacquainted with the work of the Library of the Faculty of Medicine of Buenos Aires) it is often very difficult to locate articles published in Argentine medical journals. Argentine surgery, however, is satisfactorily covered in special supplements issued twice yearly since 1960 by *Revista argentina de Cirugía*. This supplement *Bibliografía quirúrgica argentina* includes all surgical articles published in Argentine medical journals; the October-December 1967 issue

Table II. *Bibliography of Argentine surgery (Bibliografía quirúrgica argentina).*

Period indexed		Bibliographic entries	Volume
1. 1.1960	30.9.1960	356	1
1.10.1960	31.3.1961	576	2
1. 4.1961	30.9.1961	606	3
1.10.1961	31.3.1962	508	4
1. 4.1962	30.9.1962	466	5
1.10.1962	31.3.1963	396	6
1. 4.1963	30.9.1964	1648	7
1.10.1964	31.3.1965	552	8
1. 4.1965	30.9.1965	746	9
1.10.1965	31.3.1966	557	10
1. 4.1966	30.9.1966	655	11
1.10.1966	31.3.1967	497	12
1. 4.1967	30.9.1967	938	13
Total		8501	

gives a list of 37 journals and references to 938 articles published between April 1 and September 31, 1967 (Table II).

As regards *public health,* the most urgent problems in Argentina at the present time are improvement of co-ordination of the medical and administrative sides of the health services, organization and administration of hospitals throughout the country, and recruitment and training of the skilled staff required to deal efficiently and quickly with the first two problems. The information necessary to each of the professions concerned with public health is collected and co-ordinated by appropriate organizations already existing in the national, provincial, and private sectors.

In the public sector there is, first in order of importance, the Latin American Center of Medical Administration in the Argentine Republic. This was instituted on April 7, 1967, as the result of an agreement concluded between the Secretariat of State for Public Health of the Ministry of Social Welfare, the University of Buenos Aires, and the Pan American Health Organization, and since ratified by the Argentine government (Regulation 17560, December 4, 1967). The functions of this Center are to provide technical assistance for education and research in administrative medicine, to undertake research related to the analysis and utilization of information, and, as directed in its plan of action, 'to organize a section of translations and publications designed to publicize the activities of the Center, and to distribute the information, in the Castilian language, to individual workers in the Americas.' Other centers which provide information relevant to public health are the following:

School of Public Health of the University of Buenos Aires.
Library of the Secretariat of State for Public Health (Buenos Aires).
Center for Clinical Research (Buenos Aires).
National Council for Development, Public Health Section (Buenos Aires).
Federal Council for Investments, Public Health Section (Buenos Aires).
Medical Federation of the Argentine Republic (Buenos Aires).
Center for Research and Education in Public Health, which in every

number of its journal *Administrative Medicine* publishes a revised bibliography of this subject.
Torcuato di Tella Institute, a center for research in economics.
Medical Federation of Buenos Aires Province (La Plata).
Center for Medico-Social Documentation and Information of the Medical Association of La Plata (La Plata).
Center for Hospital Documentation of the Ministry of Public Health and Social Welfare of Santa Fe Province.
Library of the College of Medical Practitioners of Santa Fe Province, Section 1 (Santa Fe).
For information of an international character there is the Faculty of Justice and Social Sciences of the UNESCO Center for Documentation (Buenos Aires).

I will conclude this brief report in the words of the distinguished philosopher and thinker Ortega y Gasset (1945): 'Knowledge has become something uncontrollable, oceanic, arousing in Man a sensation of anguish — the anguish aroused by excess of riches, by immeasurable possibilities. It is urgently necessary to find a solution, to clear away dead wood from this jungle, to separate the essential from the superfluous, and to reorganize what remains in a form which is easily assimilated, stored and controlled. For this a new discipline – the cultivation of synthetical ability – is needed. Above all we need a simplified system of work, whereby the individual is relieved of mental effort in bringing his intellectual reserves into action: everything that can safely be mechanized must be mechanized. In this way we shall be enabled to salvage and organize our own store of the knowledge in which, willy nilly, we are now immersed as in a stormy sea.'

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8

individual libraries

plans for new information systems and health sciences library at the ohio state university

J. A. Prior

The library constitutes one of the most important reasons for the very existence of any educational institution. It is the conviction of the College of Medicine that the Health Sciences Library should be the *intellectual, cultural,* and *information center* of that rapidly growing sector of the campus. All would agree that there is an urgent need for a greatly expanded and improved library facility; the present one is quite inadequate. Originally planned for 40,000 volumes and 128 seats, the present library now has its shelves crammed with more than 96,000 volumes and there are 141 seats. If the College of Medicine is to provide the best environment for education and research, it must have new and greatly enlarged facilities to assist faculty in dealing with the unprecedented growth in health science information and must develop new and more efficient techniques to deal with the information explosion. Also, the library should be in the most central location where it will be the most convenient to the greatest numbers of patrons.

To develop new information services and to plan a library building, the Health Sciences Library Planning Committee was formed. Aided by the Information Services Committee, the Planning Committee has had as its prime objectives:

1. Conversion of the library from its traditionally passive role as a receptacle for books into an active developer, processor, storer, and distributor of information, to create the image of the library as the information center;
2. The development of new information services to assist its patrons in dealing with the explosion of health sciences literature;
3. Prompt response to the literature needs of the scholars at all levels; and
4. A new and greatly enlarged facility oriented toward patron service.

It has been the aim of the Planning Committee to provide as pleasant a facility as possible, in fact, to be so inviting that it will encourage very busy people to utilize the services of the Library more extensively. The present and future developments in information services have been a constant and vital influence throughout the planning of this facility. A new and unique automated bookstack system will provide rapid response to patron needs. Emphasis throughout has been upon the development of facilities for individual study.

new information services

The College of Medicine believes that an essential function of a truly modern information center as contrasted to the traditional library is the steady development of new information services to assist students and faculty in dealing with the deluge of new health sciences information. A prominent information systems consulting firm was hired to develop long-range plans for new information systems. Their report suggested a step-by-step, phased program, an essential aspect of which was that it is impossible to develop a massive information system all at one time, that it is essential

to have a long-range plan, but that each new service must be fully implemented before proceeding to the next. At this time they provided important information as to the impact of the developing information sources on the building plans.

The following major developments in new information services have been accomplished or soon will be available:

medlars

Demand bibliographic searches: through the courtesy of Dr. Mairtn Cummings, Director of the National Library of Medicine, the tapes of the computer-based MEDLARS were made available to us. After a year of study and development (at the expense of the College of Medicine), the MEDLARS service became fully operational in January 1967, at which time it was one of only two fully operational centers outside the NLM in which demand searches were formulated by trained searchers, and the actual computer search of the tapes was performed.

In June 1967, a contract with the NLM was completed for Ohio State University to serve as the MEDLARS center for the state of Ohio and was supported in the amount of $50,585. In June 1968, the contract with the NLM was expanded to $105,000, and Ohio State University now serves as the MEDLARS center for the region of Ohio and Kentucky. The complete set of MEDLARS tapes is available for the support of the biomedical scholars of our area.

Recurring search bibliographies: if a faculty member or student is pursuing a study in depth and needs to be continuously updated on his particular field of interest, recurring search bibliographies can be provided from each new tape as it is delivered monthly from the NLM. Recurring search bibliographies of each new tape represents, a review of 16,000 to 20,000 citations. The individual's interest profile is established with our reference librarians.

On-line access: we firmly believe that there is a genuine need for immediate access to the latest biomedical information, especially in the clinical areas of the medical center. For this purpose, the need may not be for a search of the full file but for a few of the latest and most generally useful references. The study by Mr. Frederick Kilgour, now Director of our Ohio College Library Center, made while he was Director of the Yale University Medical Library, showed that 250 journals will answer the needs of at least 80% of the users. Thus, one possibility is that this core of most commonly used citations be made available on-line through several terminals in the University Hospitals and the Health Center Library, so that, using the hospital computer, there will be prompt access to the latest bibliographic information. Only the most recent citations will be produced, although journals and/or authors may be elected. Only a limited number of references will be provided, at present ten in number. Another possibility under consideration of the Information Services Committee is the provision of on-line access to abstracts as provided by Excerpta Medica.

cbac

CBAC is a computer-based current awareness service developed by the Chemical Abstracts Service covering the current literature of the world on the *C*hemical *B*iological *Ac*tivity of organic compounds.

The computer program for CBAC, as developed by the Chemical Abstracts Service, has been extensively rewritten by the Information Systems and Programming staff of the Ohio State University Hospitals to provide not only the *bibliographic data* but the *full digest* of each article cited, including the registry number and molecular formula of chemicals mentioned. We are the first institution in our country to provide this expanded current awareness service which is now available to our faculty and advanced students every two weeks as new tapes are received Each user determines with our medical reference librarians his own profile of interests to which the program responds.

Our most recent development in CBAC is the ability to provide *retrospective searches* of our accumulated tapes for our staff and students

library

The Planning Committee has tried to plan a facility that will be the focal point of the educational process with efficient reference services, new information systems, and a rapid volume delivery system. Some of the unique features of this library will be:

automatic bookstack system

The automatic bookstack system is an electronically controlled and automated system of book storage and retrieval. This will be the central feature of the library, in fact, one entire wall will be glass so that the entire electromechanical filing and retrieval operation can be observed by patrons and visitors

The stacks will be 22 feet 8 inches high (two floors in height), each with 20 shelves. Instead of the conventional stacks of volumes, the monographs and bound serials will be in containers 15 inches in length, holding an average of 8 33 volumes per container. There will be 11 aisles with a capacity of 174,000 volumes. Each aisle will be 34 feet in length but only 20 inches in width.

In each aisle is a motorized column called the *master column* that extends the full height of the shelves. This column moves quite rapidly in a horizontal plane (10 feet per second) On each master column there is an electrical extractor/discharger ('picker') which operates on a vertical plane. Using a 10-key board at the circulation control desk, the master column selects the container from the stacks of the appropriate aisle, places the container upon the conveyer belt and delivers it to the circulation control desk. After the volume has been delivered to the patron, the operator depresses a foot switch and the container is automatically returned by the refile conveyer to the appropriate aisle, where it is returned automatically by the master column to its own individual, unique location.

There will be 4 *operating consoles*, 2 on each floor. Each console has full access to the entire collection for calls and refiling. During periods of peak activity several consoles will be used, but during quiet hours only one operating console will provide full service to the patrons. Since the prime purpose of the automatic bookstack system is the provision of the best possible service to the patron, calls always take precedence over the refile operation.

From the most remote corner of the stacks a volume can be delivered to the circulation control desk in less than 2 minutes.

To be refiled, a volume is inserted under a sensing head which calls the appropriate container to the console. However, the container which has been called by means of the code on the volume does not move the full distance of the console so that the operator can insert the book. Instead, the container stops short under a plexiglass cover so that volumes can neither be removed nor refiled. The container will move the last 15 inches only if the volume is inserted again under the sensing head. Only if the code of the book matches the code of the container will the container move on so that the volume may be refiled. Thus, there is genuine verification of refiling and lost volumes should be a thing of the past.

It is essential to note that the automatic bookstack system has only electronic, electromechanical, and mechanical controls which have been tried and proven in many other electromechanical devices; it is only the application that is new. Controls are grouped by function for ease of replacement.

In the traditional sense, browsing will not be possible with the automatic bookstack system. However, because of the ease and rapidity of delivery of volumes, a different kind of browsing becomes possible in which the patron does his browsing through indexes and abstracts. The use of the Health Science Library is primarily mission oriented for the solution of a specific problem or for study in a particular area. It has been shown that most browsing in the Health Sciences Library is concerned with the journal literature of the past 18 months. These serials will be in a comfortable, inviting, and very accessible area where high-speed photoduplication will be available. Only a small proportion of reserve volumes will be maintained in open reserve because of the high-speed delivery of volumes kept on reserve.

In addition to its prompt response to the needs of its patrons, the automatic bookstack system has another major impact upon the Library. In contrast to the usual library in which over 40% of all of the net assignable space is occupied by conventional shelving, only 10.8% of the assignable space is utilized for the storage of volumes. This includes volumes outside of the automatic bookstack system, namely, reference texts, indexes, and abstracts. An obvious corollary of this figure is the very high percentage of net space that can be used for patron seating, 67.7%.

computer circulation control

After the patron presents the call number with his identification card to one of the circulation control operators, the call number is introduced into the system using a 10-digit keyboard. The circulation file is searched by on-line access to a computer. If the volume is in, the automatic retrieval system — in microseconds — is activated to bring the tray containing the book to the operator at the circulation console and the volume is simultaneously charged to the patron by the computer, thus assuring the security of the collection. As a consequence, any number of exits become feasible, and it will no longer be necessary for patrons to funnel through a single exit for inspection of briefcases. On the other hand, if the book requested is out, that information will be displayed in microseconds to the operator by cathode ray tube.

All volumes in the collection will be imprinted on the back cover with a machine-readable coding device When the book is returned, the volume is passed under a sensing head at the circulation control station, the charge is cancelled automatically in the computer's disc storage, and at the same time the proper container is called to refile the book.

The computer circulation control system will enable the library to respond rapidly to the literature needs of the scholar that have been generated by the growing number of information services Patron time will be reduced because of elimination of charge cards, save forms, and trace forms. The computer will daily provide overdue notices as well as notice of availability of volumes. Potential for analytic study of the use of library materials will be greater than ever before. When coupled with an on-line computer-controlled circulation system, the automatic bookstack [illegible] and retrieval system will provide for the first time a library virtually free from [illegible] and error-producing clerical routines.

Parallel to the planning of the Health Sciences Library [illegible] Library system, in co-operation with the Ohio College Library Cente[illegible] on-line circulation control system. In its first phase, this would [illegible] to the collections using author and title via cathode ray [illegible] using subject searching. This development will be integrat[illegible] Health Sciences Library even before the completion of [illegible], the transmittal by the patron of the call number to the [illegible] control console may be accomplished automatically, so th[illegible] would be already delivered, charged out, and waiting at the [illegible] user could get there in person.

auto-didactic carrels

As an outgrowth of a series of seminars on medical education, the faculty believes that a major goal is the cultivation of an educational environment that can best be characterized by a quote from John W. Gardner, former secretary of HEW in his book, *Self-Renewal*: 'The ultimate goal of the educational system is to shift to the individual the burden of pursuing his own education.' Medical students as well as other health professionals are intelligent, highly motivated young people who are capable of assuming an increasing degree of responsibility for their own education. Consequently, the Health Sciences faculties have been striving to develop both programs and facilities to assist the student in assuming a greater degree of responsibility for his own education, at his own rate, and in his own way.

auto-didactic laboratory

As a step toward the goal of self-education, an auto-didactic (self-teaching) laboratory was established, which now contains a wide variety of self-teaching devices: movies, filmstrips, single-concept films, sound tapes, kodachrome slides synchronized with sound tapes, video-tapes, and computer-assisted instruction. Here students can indeed pursue their own education in any subject of their choice in their own way and at their own speed.

choice. More than one-third of the last two year [illegible] in medical [illegible] is now available for elective studies or for the pursuit of research under the g[illegible]ce of a faculty advisor. As a result of these curricular change[illegible]dents have no[illegible] much greater opportunity to use the resources of the informa[illegible]nter but mu[illegible]ter need.

II

the mayo clinic library

T. E. Keys

'As the calorimeter tells the activity of the patient's metabolism, so may y determine the plus or minus activity of the local profession in any district by the conditi of its library.'

Harvey Cushi
Amer. J. Surg., 4, 101, 19

origin and development

Drs. Will and Charlie Mayo had access to a fine library early in life. This w their father's collection of books (Keys, 1941), and it contained many volumes. commenting on this library, Dr. Will (Mayo, 1941) said:

> *I believe that the atmosphere of books is one of the most important formative facto in the development of young minds. The family library in our home was the livin room; there were books from the floor to the ceiling, and our mother and father ga us books to read which were appropriate to our age. I well remember Dicke works. . . . When we were in the grammar schools and the high school, Father ga us treatises on the sciences to read at home: Charles Darwin, Thomas Hen Huxley, Ernst Heinrich Haeckel and Sir James Paget, which were intense interesting to us. . . . [In medical school] we were devoted to Gray's 'Anatomy' a Holden's 'Landmarks'. . . .*

Dr. William Worrall Mayo's library also contained many important 19th centu medical books, and doubtless these too were read by his sons.

persons and organizations

While there were some medical books and journals in the early offices of t Drs. Mayo and later those of their associates, it might be said that the Mayo Clin Library (which is also the library of the Mayo Foundation) was initiated in 190 This was when Mrs. Maud H. Mellish (Fig. 1) was appointed 'to organize and develo a medical library and to do editorial work in connection with the publication papers' (*Guide to the Use of the Mayo Clinic Library*, 1967). A year after Mrs. Mellish appointment, the collection of books had become much larger and plans were bein made for a separate library building, which was erected in 1909 (Fig. 2).

In 1914 the library collection amounted to 4,000 volumes, and it was moved t the first Clinic building, which was completed in that year. The Division of Publica tions had been organized at this time to include a library section (Fig. 3), an editori section, and an art studio. Mrs. Mellish was director of the Division, but soon sh found it necessary to devote most of her time to editorial work. Then came a successio of librarians, all female. Some of them married Mayo physicians; others took employ ment elsewhere. In 1929 the library was moved to the 12th floor of the Plumme



ı. 1. Mrs. Maud Mellish-Wilson (1862-1933), first brarian of the Mayo Clinic. Photograph taken about 07.

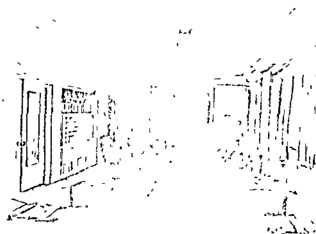


Fig 3 From a sketc



2. The Mayo Clinic Library building, 1909. From etch by Russell Drake.

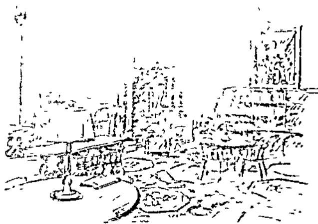


Fig 4. Mayo Clinic Library reading room, 1933 From a sketch by Russell Drake.

Building (Fig. 4). Interestingly enough, it is still the library headquarters, although in the interim, floors 11, 14, 15, and 16 have been occupied and modernized.

expansion of journal collection

Although, generally, the library grew in accordance with the Clinic's development of group practice, adding many important journals, textbooks, and monographs as

they were published and recommended, two concerted efforts were made to build up the journal collection. The first occurred shortly after World War I. In the 1920s many important sets of medical periodicals were obtained. Most were from Germany and France, some from Great Britain. Of course, as the Clinic's practice expanded into the developing specialties, the chief journals in those fields were added. In all matters concerning Library policy the Library Committee worked in harmony with the Clinic's Board of Governors. Dr. William J. Mayo (1924) emphasized the importance of medical periodicals when he said: 'The profession as a whole is keeping abreast of the times by means of medical journals, and these periodicals must be recognized as the greatest force in medical education.' Dr. Will's wise philosophy is still guiding the development of our library.

When I became head of the Library in 1946, another concerted effort was devoted to building up the journal collection. A basic list of journals was prepared, consisting of those journals indexed by the *Quarterly Cumulative Index Medicus* not possessed by the Library. Another basic list was prepared of those journals owned by the Biomedical Library of the University of Minnesota, the John Crerar Library in Chicago, the Welch Medical Library of Johns Hopkins University, and other leading medical libraries. From all this, a want list was compiled and sent to some 30 medical book dealers in the U.S.A. and abroad, and, with support of the Library Committee, an aggressive journal buying campaign was carried through. The resulting purchases over a 5-year period greatly enriched the holdings of the Library.

This expansion program was not inexpensive, but the value of the volumes purchased during that time has increased four-fold. When the Librarian and the Chairman of the Library Committee conferred with Mr. Harry Harwick, the executive officer of the Board of Governors, about their plan, he said, 'Go ahead; and if you spend too much money, I'll scream!' Mr. Harwick never screamed. We were fortunate, too, that during the war years we were able, by the help of Dr. E. J. Baldes, to have the German periodicals put aside for us in Germany. As soon as the war was over, they were shipped to our Library. For this reason our holdings of periodicals in German are fairly complete.

gifts and exchanges

Another activity has been our gift and exchange program. Through the generosity of the permanent staff and the fellows of the Mayo Foundation, a large number of duplicate books and journals had accumulated after the war years. It was believed that the duplicates, many of them war issues, might be of value to foreign medical libraries, and it seemed almost a crime not to make them available. So an inquiry was made, and 72 foreign libraries took advantage of this offer. This project became a program, and in 1967 more than 16,000 separate journal issues and 582 medical books were donated or exchanged for items needed by our Library. The Library has also participated over the years in the MLA's exchange program, and many choice duplicates are given annually to our sister libraries belonging to the Association.

Another feature of our program has been the exchange of duplicate volumes of the *Collected Papers* of the Mayo Clinic and the *Mayo Clinic Proceedings* for more than 500 desirable journal subscriptions.



Fig. 5. Mayo Clinic Library study ledge, 1957.

adaptation and expansion

A major program of expansion and remodeling was completed in March 1957, 50 years from the date of the establishment of the Library. The task (Kennedy *et al*, 1958) was formidable because the scope of the expansion was limited by the amount and location of space and the existent structural features in a building designed primarily for other purposes. Nevertheless, the transition was achieved with gratifying success.

Part of the problem resulted from the accelerated growth of the collection. This had made it necessary, beginning in 1943, to install extra shelving on the 13th floor — the 'bowels' of the Plummer Building — in competition with piping and machinery, on top of the 12th-floor stacks, in the corridors in the Clinic's warehouse about two blocks away, in the 4th floor of the Franklin heating station, and in the basement of the old and now torn-down Hotel Damon. Thus in July 1955, when there were about 90,000 volumes in the total collection, not quite half were housed in the Library proper, and the rest were distributed among the several inconvenient locations mentioned. Fourteen years of this worsening frustration were ended in 1957, and the Library has not been in such bad shape again. After the 11th floor was remodeled and the new stacks installed, the quarters air-conditioned, proper light provided, and a new feature, the study ledges (Fig. 5), erected, the Librarian took the Board of Governors on a tour. The Chairman, Dr. Samuel Haines, said, 'Tom, I had no idea we had such a fine collection!' By this time, too, the Library's administrative offices were located on the south side of the 12th floor and new study areas for the staff were built on the 14th floor. The Section of Publications was relocated on the 10th floor, still close to the Library, which is important to all concerned. The 16th floor was

remodeled for stack space to house the ever-growing accumulation of duplicates. But the 12th floor remained the focal point of the Library.

current projects

When the Mayo Graduate School moved to the Harwick Building in 1965, the 15th floor was allocated to the expanding medical history collection, which will be discussed later. Presently, the development of the Library is continuing, as it always should. The explosion of the medical literature, the changing concepts of graduate medical education, the continuing emphasis on reading in the fellowship program, the increase of the reading population to 700 fellows and about 450 consultants, the emphasis on continuing medical education, the possibility of a new medical school, and the expansion of the Library's staff to serve the ever-enlarging demands of readers for books and journals have all contributed to the changes that are in progress.

Temporarily, the current journals are housed in the Reading Room, and the resulting rearrangement has left only a minimum of reading space. To remedy this situation, Plummer Hall, on the 14th floor, and the surrounding space will be used for an enlarged reading room, study, and library area.

library computer program

Necessarily, the Library will become more and more involved with computers. Their use can make it more effective in many ways. At present, two computer projects are in progress. The first is the listing of Mayo Graduate School theses by the authors, subject headings, subject fields, and titles. More than 2,700 theses are listed in this way, and each year this material is corrected and updated. The project has turned out to be a large one, but the teacher and student now have this information at their fingertips in six compact bound volumes.

The second project also is highly useful. It is the listing of the bibliographies of the active staff members chronologically and alphabetically by title, including all original articles, medical motion pictures, books, and chapters of books. This list also is brought up to date annually, and, comprising as it does more than 20,000 items, it is helpful to the Graduate School. Later on, this material, too, may be indexed by subject.

Upon recommendation of the Library Committee, the Clinic's Computer Committee is now studying the feasibility of other computer applications for the Library. Being considered at this time are computer checking in of current issues of medical journals and ordering and cataloging of books. Later considerations will be circulation control via computer, and eventually computer applications that will bring library resources to the reader, be he in the library or in any of the buildings comprising the Mayo complex, or even in the Methodist or St. Marys Hospitals.

history of medicine division

It is realized that the main concern of the Library is the modern collection of books and journals. This is our bread and butter. However, it is axiomatic that a leading medical center such as ours should also possess the notable books in the history of medicine. The profession of medicine has a rich culture, and the great

DE
VISCERVM
STRVCTVRA
EXERCITATIO
ANATOMICA
MARCELLI MALPIGHII
Philos. & Medic. Bononien. in Messanensi
Academia Medicinæ Primarij.
Accedit
Dissertatio eiusdem de Polypo Cordis.



BONONIÆ,
Ex Typographia Iacobi Montij. MDCLXVI.
Superiorum permissu.

Fig 6. Title page to the first edition of Malpighi's *De Viscerum Structura*, 1666 From the copy of the History of Medicine Division, Mayo Clinic Library (gift of Dr William F Braasch).

THE
ANATOMICAL
E[illegible]rcises of
Dr. WIL[illegible] HARVEY
Profe[illegible] of Physick,
[illegible]
Physician to [illegible] Majesty,
Concerning [illegible]
[illegible]
The [illegible]

Fi[illegible] [illegible]ition of Ha[illegible] From the c[illegible] Division, Ma[illegible] Dr and Mrs. Wal[illegible]

historical books are useful not only for exhibits but also for teaching A recent example was the historical book tour by the fellows in Neurology for one of their weekly meetings. Every member was amazed at the historic books and articles on neurologic subjects contained in our Library. It is hoped that other specialty groups will hold similar book evenings.

Besides the fundamental classics (such as Vesalius' *Anatomy*, 1543, presented to our Library by Dr. Erwin Strassmann of Houston, a former fellow), the Library Committee has chosen four particular fields for emphasis in the building of our historical collection: neurosciences, anesthesiology, immunology, and cardiology. In building up the rare book collection these fields have been given priority, although every desirable gift in any medical or allied field is welcomed Two prime examples of recent gifts are Malpighi's *De viscerum structura exercitatio anatomica*, 1666 (Fig. 6), and the first English edition of Harvey's treatise on the circulation: *The Anatomical*

Exercises... Concerning the Motion of the Heart and Blood... 1653 (Fig. 7). When purchasing rare and historic books the Library Committee has always kept in mind that the Clinic is 'custodian of the patient's dollar', and therefore no item is considered whose price is unreasonable.

The History of Medicine Division is housed on the 15th floor of the Plummer Building. In adapting these quarters to this use, special attention has been given to work and study spaces. The folio volumes are housed separately from the smaller ones. The whole division is specially air-conditioned, and the humidity control allows for adequate moisture so that the books can 'breathe', thus ensuring their preservation. Many of the volumes were donated by the Fallon family of Worcester, Mass., in honor of the late Dr. John Fallon, a former President of the Mayo Alumni Association. Many were acquired by the Librarian on a buying trip to Europe in the fall of 1962, and a large number were purchased from a California physician in 1964 through a book dealer.

patient's library

A free library service for patients at Rochester Methodist and St. Marys Hospitals is provided by the Mayo Clinic with the co-operation of the two hospital administrations. The purpose is to furnish satisfying non-medical reading which will contribute to the enjoyment and welfare of all hospitalized patients, whether adults or children. This department of the Mayo Clinic Library is under the direction of Miss Ruth Tews (Fig. 8) and her staff, who work in harmony with about 40 volunteer



Fig. 8. Mayo Clinic Library's reading service for hospitalized patients.

'Pink Ladies' especially trained by Miss Tews for this challenging and rewarding service.

A well-selected collection of about 14,000 volumes, including popular and classical literature in English and foreign languages, is housed mostly in the two hospitals. Part of the collection is also kept in the main Library, and the offices of the hospital librarians are with the other offices in the Mayo Clinic Library. The

volunteers work in these libraries and on the floors of the hospitals according to their assignments with the hospital librarian on duty.

library services

We realize that a library is just as good as the services it can provide for its readers. We take pride in providing our readers with as quick and efficient service as we can. We look forward to more computer applications that will increase the Library's ability to make its resources more selectively and more readily available.

A most important aspect of this function is performed by our *Reference Department*. We delight in answering questions of a reference nature in a speedy yet thorough manner. A device which recently has speeded up our inter[illegible] loan service is our teletype by which we can communicate very quickly with [illegible] medical center libraries.

Another service greatly appreciated by our physicians [illegible] *service* for our permanent staff. Written translations of important [illegible]tions are produced on a limited scale.

The greatest direct service of the Library [illegible] the *circu*[illegible] books and journals. General assistance to readers in finding [illegible] need is available at the circulation desk. Nearby, too, [illegible] the Library holdings, listed by author and subject. There is [illegible] too long, but the reader is expected to bring it back when due [illegible] circulation has grown by leaps and bounds, manifesting conti[illegible] facilities In 1968, besides books and journals used inside the [illegible] reproduced by staff and fellows from copying machines, the Libra[illegible] [illegible]ulated [illegible]7,[illegible]7 books and journals, and the circulation is still increasing.

Before circulation or reference work, it is necessary that the books and journals be *acquired* and cataloged. A recent decision of the Library Committee has speeded up the ordering of books. Those recommended by members of the permanent medical staff are ordered immediately if their cost is less than $35. Books costing more are considered for purchase at the regular meetings of the Library Committee. New journal subscriptions are carefully considered Usually the first order is for a 1-year period, with renewal to be considered after that. Back volumes are obtained whenever available if the journal is of importance. We pride ourselves in having our periodical collection as complete as possible.

The head of our *Catalog Department* has the responsibility of maintaining and keeping up to date the Library's catalog. The catalog can be thought of as a method of interpreting the library's resources for the readers. At present the multi-drawered catalog is on cards arranged by author, title, and subject. Location symbols also are indicated on the cards. Since the present classification system is obsolete, steps are being taken to reclassify the books according to the LC schedules.

The *binding* of loose issues of journals into volumes, the rebinding of much-used monographs and textbooks, and the restoration and rebinding of rare and historic books are important library functions. In binding, every effort is made for prompt and efficient service. Long absence of volumes detracts from the Library's usefulness. Therefore, with our two commercial binderies, a schedule of service in 2 to 3 weeks is

become what it is today without continued emphasis on its importance and justification of the measures that have been necessary to its development.

Today, most emphasis seems to be on computers, on information retrieval systems, on instant information. There are many good traditional libraries, but too often librarians are losing sight of their qualities and forgetting that behind all this advancement in information retrieval, which is certainly necessary, there must be scholarly basic collections. If the basic collections are inadequate, what then? What is 'instant information' without the information? Although many librarians feel that, unless they have the latest, service will suffer, we must not lose sight of the basic service given by our dedicated librarians. Service will suffer when librarians depend entirely on machines and forget that we are, first of all, librarians.

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an example of collaboration between the university and a private research institute: the french orl documentation centre

J. Archimbaud

Relatively little known, the French ORL Documentation Centre is certainly one of the most comprehensive in its special field. The publications which it receives and extracts, and those which it publishes, put it in the forefront of those which have the task of handling information in the very specialized field of otorhinolaryngology, to which it is convenient to add broncho-oesophagology and maxillo-facial surgery.

The idea of such a Centre and of its operation were conceived at Lyon in 1956 by Dr. Pierre and Dr. Louise Trenque, with whom I immediately offered to collaborate. A little later this Centre moved to Clermont-Ferrand and thanks to the support of M. Jean and M. René Chibret, the directors, became part of the Institut Chibret, which constitutes the scientific research section of the Chibret Laboratories. These Laboratories, set up in 1902 at Clermont-Ferrand by Henry Chibret, the nephew of the founder of the Société Française d'Opthalmologie, specialized at first in ophthalmological preparations, then added otorhinolaryngological products in 1954 and, more recently, general medicinal preparations. These Laboratories are known the world over: their distribution network covers Europe, the Middle and Far East, much of Africa, and Latin America.

The construction, in 1961, of a big complex of buildings at Clermont-Ferrand enabled these Laboratories to set up a scientific research institute which, under the name Institut Chibret, brings together a research organization (covering chemistry, physics, biochemistry, bacteriology, physiology and pharmacology, and virology) and bibliographic resources consisting of three medical and scientific libraries which comprise altogether about 6,000 books and theses and 360 periodical titles. This bibliographic section includes, in addition to a library devoted to pharmacology and therapeutics, an international documentation centre for trachoma, and the French ORL Documentation Centre which is the subject of this discussion.

The exceptional feature of this Centre lies in the fact that from its inception it has brought together the differing but mutually complementary bibliographic resources of a private organization, the Institut Chibret, and of a large university medical library. As Librarian, and later Curator, of the Library of Medicine and Pharmacy of the University of Lyon from 1955, and of Clermont-Ferrand since 1956, I undertook the direction of the French ORL Documentation Centre from its inception. Although remaining entirely separate, the holdings of the two libraries, one specialized and the other general, make up an admirable whole, and all the holdings are subjected to very detailed documentary analysis. At a time when one often deplores the separation of the academic from the industrial and private spheres, and the lack of collaboration that follows, I thought it would be valuable to outline the working of a documentation centre which benefits from an association becoming ever more fruitful in the light of experience over the years.

the collections

Everyone is aware of and deplores the ever-increasing nun periodicals. Only a library of the stature of the NLM can achieve th tive coverage which one finds in *Index Medicus*. A specialized docu will strive to collect as much as possible of the scientific publicatio books at first, but especially all the scientific journals of the world relatively circumscribed, field. Its library stock will therefore tenc cialized, and, as a corollary, a large number of publications in gen restricted to the field of a particular specialty, will escape its attenti

The university libraries, on the other hand, such as those o Medicine and Pharmacy, specialized though to a degree, have the c books, journals, and other publications which sometimes are very sp but in the main are 'general' and combine differing though at time fields. (In the case of ORL one would think of stomatology, plastic s logy, and gastro-enterology.) The often considerable number of jour in the university library very much enlarges the volume of material searched, indexed, and handled by modern information networks. see how much these two types of library, concentrating effort on specialty, are destined to make up a whole? With very rare exception centres can never match, by themselves, in fields beyond their m bibliographic efforts of the university libraries which in spite of eve mid-20th century, still have something of an all-embracing role to pl

It could, of course, be claimed that scrutiny of the large bib already in existence, such as *Index Medicus* and *Excerpta Medic* wholly satisfying, at least complete, in the sense of having a grea specialized information already assembled, and this remains true ev tion outlined above, which will never achieve exhaustive coverag the libraries thus associated. But the overriding consideration documentation centre to have on its library shelves the p files, in order to enable their immediate consultation an eventually in microfilm and photocopy form. Informatio ered as widely as possible, but the first consideration is should themselves be gathered together.

Starting on that basis, the Frenc Centre w

1. The Library of the ORL De he I on subscription, less often by excha ferent countries, and ensures their regu these journals are passed to the indexe Medicine and Pharmacy of the Universi be obvious, is the journals that he hims particularly). Once indexed, as will be desc library of origin, *i.e.*, the Institut Chibret,

2. The University Library of Medici a special department, housed in the F

University Library. It serves the students, the teaching faculty, and the research workers of the University. It has new, modern accommodation (Faculty and Library were opened in 1967). Founded in 1956, this medical section acquired stock from the central University Library, which it has been able to enlarge greatly in eleven years. It holds at present more than 15,000 books, 15,000 journal volumes, and about 135,000 theses. Of course, these collections cover all fields of science and medicine likely to interest the research workers who use them. ORL has only a limited representation in the body of a Library which by its nature, as I have pointed out, remains essentially encyclopaedic.

But the great point is to be able to keep track of a very large body of general publications, especially those provided by non-specialist scientific journals, *i.e.*, those not specifically falling within the ORL field. The University Library of Medicine currently receives 750 journals regularly. If some of those never include material of interest to ORL, all the others, and there are many, are systematically scanned by the Curator. Sometimes a single article in a journal of surgery, radiology, physics, or biochemistry is indexed and put on a punched card for the file of the ORL Centre. There is, therefore, from a university library, documentary help, undoubtedly comparatively limited in terms of quantity, but of the very greatest value because the information so gathered is that which normally escapes the attention of a specialized centre. Furthermore, the scientific journals in the possession of the University Library of Medicine are either lent to or photocopied for the French ORL Documentation Centre. Similarly, readers in the University Medical Library receive reciprocal privileges from the ORL Centre.

organization of the document file

Every journal article, whether the journal is held by the Library of the Institut Chibret or by the University Library, is read and coded. For this, we use edge-punched cards, 125 × 200 mm, for manual sorting. Each card carries the full reference of the article, book, or thesis concerned, arranged according to French Standards NF-Z-41.001, 44.002, and 44.003. These punched cards of a standard mixed 'address-document' type have been adapted to the needs of the Centre, each letter or figure having an assigned value. The cards have five fields: the 'organs' field allows an anatomical classification for 55 concepts; the 'point of view' field allows one or more subdivisions (anatomy, congenital malformations, occupational diseases, surgery, antibiotics, etc.) up to 50 concepts; the 'form' field allows clear indication of whether it is a book, thesis, article in French, etc.; another field indicates the date of an article and finally, an alphabetic sub-classification (first two letters only) adds to the coded entries a valuable definition giving the power to search under authors' names and identify specific terms (of diseases, in pathology, in chemotherapy, etc.). Despite the restriction of code symbols, several hundred combinations are available, allowing quick tracing of a precise reference. The articles are not, strictly speaking, [illegible] but the details on each card (several entries are generally used [illegible] the punched card — an advantage of this system) are, in fact, the [illegible] scrutiny, and examination of the punched cards by someone [illegible]

gives in itself much detail. The summary of the article is not given on the pun card, but the existence of authors' summaries in one or more languages is al mentioned, as well as the existence of a bibliography, with a note of the numb references cited in it.

The system of edge-punched cards with manual sorting was adopted in because of its simplicity and the economy of manpower it allowed. Effective as it is system remains somewhat tedious in operation, and consideration of the extent o total file of about 60,000 cards forces a prior symbol-by-symbol arrangement in order of increasing precision. The search of such a file is, in practice, impossible single passage. Some cards are, if necessary, duplicated several times. It is certain in the fairly near future the French ORL Documentation Centre must envisage use of an automated documentation system.

To this total of 60,000 punched cards must be added about 85,000 stand plain cards (75 × 125 mm) built up between 1956 and 1961 and, within certain broad headings, classed alphabetically. They represent 34,000 bibliographic erences, each having multiple entries assigned according to the number of point interest to be represented. It is, then, a collection of about 145,000 cards wl constituted, at the beginning of 1969, the 'memory' of the Centre, and is growin present by the regular addition of 5,000 to 6,000 cards per year. Theses and books also scanned and represented on punched cards. A special symbol is given to th which accords them priority in selection, if required.

Every card punched is matched by a typewritten slip giving the same pre bibliographic citation of the original article. These slips, arranged under well-est lished alphabetical headings, are sent to the Paris publisher Masson, who publis them in the *Annales d'oto-laryngologie* under the heading 'Presse internation O.R.L.', which will now be discussed.

publications

All material thus collected has, from the foundation of the French ORL Do mentation Centre, been published to assure its wide circulation. The first issue *Presse internationale O.R.L.* appeared in 1955 as a bi-monthly serial including, as w as a congress section and a calendar of meetings, an important bibliographic secti with very detailed author and subject indexes. This bibliography of current int national ORL work appeared in the same form regularly up to 1961; the publicati had to increase in size from 1959 to 1961, but the bibliographic section had beco predominant. All specialists knew this publication very well, with its blue cover which the title stood out on a stylized globe.

After an interruption in 1962, *Presse internationale O.R.L.* reappeared in entirely new form. Published since 1963 in the *Annales d'oto-laryngologie*, it is prin in the first section of the journal. Bibliographic citations are grouped into 21 la sections corresponding to a classification by organs, within which the arrangemen alphabetical by author. That classification is obviously more artificial than in the p and makes a detailed search longer. An improvement in this arrangement has bc brought about from the beginning of 1969. The references are grouped under

headings, further divided into 75 subsections, which allows much more detailed indexing. The introduction of 'points of view' (pathology, tumours, surgery, etc.) in each section, without giving the degree of precision of subject indexes, greatly aids a detailed bibliographic search. This bibliographic publication inserted in the *Annales d'oto-laryngologie* can easily be detached for binding separately. Books and theses are included; they are, in addition, the subject of an independent semi-annual publication of the University Library of Medicine of Clermont, entitled *Les Publications O.R.L. en France et dans le monde.* This bibliography has appeared regularly from January 1969 in the *Journal français d'oto-rhino-laryngologie (Lyon).*

IV

an international biomedical library in dacca and the use of world-wide medical information services

P. Molla

The Pakistan-SEATO Cholera Research Laboratory (P-SCRL) was established in 1960 under a joint agreement of SEATO member countries and the U.S. AID program, in pursuance of Article 3 of the SEATO Treaty as a recognition of the pledge for mutual co-operative effort and self-help to lift the standard of living and to bring economic and social progress to these countries. A SEATO Conference on Cholera was held during December 5-8, 1960, at Dacca, at which the sponsors dedicated the P-SCRL to provide investigations on cholera and other enteric diseases. Valuable information on cholera was exchanged by international senior scientists acknowledged as leaders in this field. The laboratory is housed in one of the wings of the Institute of Public Health.

The library was created in 1962 with a few books housed in a small room. A librarian was appointed in 1962 for a term of three years. He carried out all administrative and routine duties. In absence of any other library facilities for the other medical organizations within the complex, this new library started giving book-loan facilities to the Institute of Public Health, the East Pakistan Vaccine Laboratory, the Pasteur-cum-Vaccine Institute, the Institute of Para-Medical Training, the Tuberculosis Hospital, the Malaria Institute, and reference facilities to the medical community in general. With every opportunity improvements were made, such as reclassification of books by the Barnard scheme, introduction of a subject catalogue, a shelf list card catalogue, a list of periodical subscriptions and backfiles, and lists of newly acquired books, which were, incidentally, circulated within the complex and throughout the country's medical community. The average increase in acquisition was 124% during first three years and 321.6% during next three years. Similarly, the average increase in information demands (interlibrary loans and photocopies*) was 45.7% during first three years and 323.6% during next three years (Table I).

our efforts

As a first step towards the solution of problems such as lack of space, staff shortage, over-crowding of library materials, and greater extension of library facilities to a wider group, the libraries of the P-SCRL and the Institute of Public Health** were combined after an agreement among the directors of the two bodies and the librarian, in March 1966. The entire responsibility for combining the collection in a newly provided library was entrusted to the only staff librarian. Within a month, the new air-conditioned library greeted the readers with separate sections for periodical

* For the sake of convenience in statistics, an average of ten photocopy pages make one journal article. We provided 1630 pages in fiscal 1967 and 4160 pages in fiscal 1968.
** The Library of the Institute of Public Health was created in November 1963 having a total of 547 books up to May 1966, when the collection was combined with the P-SCRL Library.

Table I. *Library acquisitions.*

Fiscal Year	Books and reports	Bound journals	Annual additions	Periodicals subscribed: cumulative total	Interlibrary loan: journal articles on xerox from NLM	Loose journals received through exchange schemes
1962 Jan-June	224	155	379	—	140	—
1962-63	229	384	613	63	185	—
1963-64	202	216	418	70	203	—
1964-65	158	220	378	80	225	—
1965-66	856	348	1204	146	352	—
1966-67	662	925	1587	158	339	—
1967-68	564	301	865	196	508	477

displays, a conference room, a general reading room, a special area for seminars in the main hall, and a separate room for processing the material.

Even after the combination of library collections, the official administration of each differs widely. Briefly speaking, the P-SCRL Library gets its material from the U.S. National Institutes of Health by direct use of dollars, allowing smooth flow of foreign books and journals. Supplementary material is received through the U.S. National Library of Medicine in xerox form by air mail A basic library degree, extensive medical library experience, a fair knowledge of certain European languages other than English, and original activities are expected from the librarian. The Library of the Institute of Public Health is maintained by the provincial government, which includes the Library's needs within the budget allocations for the Institute. Lack of foreign currency for the Institute of Public Health Library leads to dependence on local booksellers, who stock a few old biomedical books and accept bulk orders annually but cannot supply most of the ordered items for a minimum of one year. Thus the budget allocations often lapse unused Absence of source libraries for biomedical information in the country, and the absence of interlibrary loan policy among available libraries, hampers the research work. The Library previously had a system of closed access. The combined Library offers open access facilities, and extended library hours.

The reference collection was strengthened by adding current varieties of information material, especially the sets of *Excerpta Medica, Biological Abstracts, Chemical Abstracts,* and *Index Medicus* to our subscription list. Processing the reprint collection was a giant-size task requiring valuable time for cataloguing and arrangement in visible files. Reprints on cholera were separated for sub-classification and catalogued under diagnosis, bacteriology, clinical, epidemiology, experimental, immunology, pathophysiology, toxins, treatment, vaccines, and bibliography. Many sources were contacted to prepare an exhaustive reprint collection on cholera.

Finding that mere acquisition of materials is not an end in *itself*, a carefully planned program was devised to train the Laboratory's research personnel in the [illegible] of the valuable information sources available in the Library and [illegible] the [illegible]

The training emphasizes the use of abstracting journals, MEDLARS and *Index Medicus*, *Bibliography of Medical Reviews*, specialized bibliographies, handbooks, and tables, so that the required information may be found with economy of time and energy by every library user. A thorough knowledge of the information within the Library's resources contributes to quicker results and furtherance of specialized research such as cholera eradication.

the use of world-wide biomedical information services

We require specialized information for cholera research. This is not available locally, the single medical journal being more clinically oriented to general medicine. The Laboratory is located half the world away from scientific research areas such as the U.S.A., Europe, and Japan. This leads to prolonged delay in procuring needed medical journals. Thus, we decided to tackle the problems of library material shortage and of delays in information service by a systematic use of the available world-wide biomedical information services.

We increased our subscription to about 200 biomedical journals giving highly specialized information on basic sciences, general medicine, epidemiology, gastroenterology, infectious diseases, etc.

We ordered key information periodicals by airmail, such as *Current Contents: Life Sciences*, *Lancet*, *Nature*, *Science*, so as to keep up with the latest biomedical information within a week of its publication.

We reached an agreement with the U.S. NLM to request and to avail by airmail the xerox copies of journal articles not available here, so as to use the facilities of the world's prominent medical library.

We requested literature searches for certain important research topics in the form of computer-produced bibliographies, being a special service of the MEDLARS program of the NLM. The investigators were provided with required articles from this bibliography by air.

We hired a Xerox copier to provide xerox copies of available journal articles, mostly from our 200 biomedical journals regularly subscribed.

We inserted an announcement in the *UNESCO Bulletin for Libraries*, offering *East Pakistan Medical Journal* and *Journal of Pakistan Medical Association* in exchange for other biomedical journals from the medical associations and libraries of the world. Within a few months about ten countries made agreements to exchange certain journals regularly. Further exchange proposals are being processed. The backbone of this exchange was a generous gift of multiple sets of the *East Pakistan Medical Journal* donated by the Pakistan Medical Association (East Zone). Later on, country-wide appeals were made to the medical community to donate their unwanted copies of Pakistani medical journals. The response came mainly from our own clientele, with whose spare copies the exchange is strengthened.

While requesting from major libraries abroad, we were introduced to the International Exchange of Duplicate Medical Literature scheme operated by the WHO Library in Geneva. The scheme suits small libraries because the work load of duplicating and distributing the want lists and offers lists among the members is shouldered by

the WHO Library, which photocopies and distributes these lists. This excellent scheme brought us within a year nearly 400 medical journal back numbers which we had been trying to obtain for a long time through other sources.

contribution to the community

The Library's reference facilities have been extended to the medical community in general. Awareness of valuable library resources has been created through various means.

Seminars on medical topics are regularly held in the Library, where local doctors, undergraduate and postgraduate students, professional colleagues in medical research, visitors, and others are specially invited by letter to attend. Subjects with popular appeal, such as family planning, typhoid, malnutrition, combined with films and slides attract many in the medical community.

All relevant books and journal articles are prominently displayed during each seminar and visitors are encouraged to browse in an open access library. Attractively coloured posters with library pointers are frequently displayed. Exhibitions of books, journals, and reprints are opportunely held during international conferences to draw the attention of visiting medical men to the Library's resources.

Regular publications of the Library, such as *Books Recently Added, List of Periodicals Subscribed Currently, Periodical Holdings of the Library, Charts of Material Variety in the Library and How to Use Those*, and the *Annual Report of the Library*, are distributed to professional individuals and institutions throughout the country.

The Librarian writes relevant articles in professional journals as a further measure of creating awareness of the Library's resources. The local 'Union list of scientific periodicals holdings in libraries of Dacca' is often consulted and requests are made personally by the Librarian for borrowing the necessary material. Because inter-library loan agreements are not popular, the material is usually borrowed indirectly through a third party. The Librarian takes active part in the management of the Province's major professional library association, thereby informing professional colleagues to recommend their clientele to our Library.

suggestions

The facilities which we have created for our Library such as getting xerox copies of needed journal articles by airmail, and acquisition of the world's duplicate and surplus journal back numbers through exchange schemes are not generally enjoyed by other medical libraries in the country. For lack of any biomedical library on the national and provincial scale, the small medical libraries are existing in isolation. A concerted effort by the governments and the 'have' countries towards the creation of national medical libraries is worth the efforts of international biomedical organizations.

It is worthwhile establishing international clearinghouses for the world's surplus library material in biomedical sciences, so that the individual national clearinghouses can automatically draw on the international clearinghouses. Many

The training emphasizes the use of abstracting journals, MEDLARS and *Index Medicus*, *Bibliography of Medical Reviews*, specialized bibliographies, handbooks, and tables, so that the required information may be found with economy of time and energy by every library user. A thorough knowledge of the information within the Library's resources contributes to quicker results and furtherance of specialized research such as cholera eradication.

the use of world-wide biomedical information services

We require specialized information for cholera research. This is not available locally, the single medical journal being more clinically oriented to general medicine. The Laboratory is located half the world away from scientific research areas such as the U.S.A., Europe, and Japan. This leads to prolonged delay in procuring needed medical journals. Thus, we decided to tackle the problems of library material shortage and of delays in information service by a systematic use of the available world-wide biomedical information services.

We increased our subscription to about 200 biomedical journals giving highly specialized information on basic sciences, general medicine, epidemiology, gastroenterology, infectious diseases, etc.

We ordered key information periodicals by airmail, such as *Current Contents: Life Sciences*, *Lancet*, *Nature*, *Science*, so as to keep up with the latest biomedical information within a week of its publication.

We reached an agreement with the U.S. NLM to request and to avail by airmail the xerox copies of journal articles not available here, so as to use the facilities of the world's prominent medical library.

We requested literature searches for certain important research topics in the form of computer-produced bibliographies, being a special service of the MEDLARS program of the NLM. The investigators were provided with required articles from this bibliography by air.

We hired a Xerox copier to provide xerox copies of available journal articles, mostly from our 200 biomedical journals regularly subscribed.

We inserted an announcement in the *UNESCO Bulletin for Libraries*, offering *East Pakistan Medical Journal* and *Journal of Pakistan Medical Association* in exchange for other biomedical journals from the medical associations and libraries of the world. Within a few months about ten countries made agreements to exchange certain journals regularly. Further exchange proposals are being processed. The backbone of this exchange was a generous gift of multiple sets of the *East Pakistan Medical Journal* donated by the Pakistan Medical Association (East Zone). Later on, country-wide appeals were made to the medical community to donate their unwanted copies of Pakistani medical journals. The response came mainly from our own clientele, with whose spare copies the exchange is strengthened.

While requesting from major libraries abroad, we were introduced to the International Exchange of Duplicate Medical Literature scheme operated by the WHO Library in Geneva. The scheme suits small libraries because the work load of duplicating and distributing the want lists and offers lists among the members is shouldered by

the WHO Library, which photocopies and distributes these lists. This excellent scheme brought us within a year nearly 400 medical journal back numbers which we had been trying to obtain for a long time through other sources.

contribution to the community

The Library's reference facilities have been extended to the medical community in general. Awareness of valuable library resources has been created through various means.

Seminars on medical topics are regularly held in the Library, where local doctors, undergraduate and postgraduate students, professional colleagues in medical research, visitors, and others are specially invited by letter to attend. Subjects with popular appeal, such as family planning, typhoid, malnutrition, combined with films and slides attract many in the medical community.

All relevant books and journal articles are prominently displayed during each seminar and visitors are encouraged to browse in an open access library. Attractively coloured posters with library pointers are frequently displayed. Exhibitions of books, journals, and reprints are opportunely held during international conferences to draw the attention of visiting medical men to the Library's resources.

Regular publications of the Library, such as *Books Recently Added, List of Periodicals Subscribed Currently, Periodical Holdings of the Library, Charts of Material Variety in the Library and How to Use Those*, and the *Annual Report of the Library*, are distributed to professional individuals and institutions throughout the country.

The Librarian writes relevant articles in professional journals as a further measure of creating awareness of the Library's resources. The local 'Union list of scientific periodicals holdings in libraries of Dacca' is often consulted and requests are made personally by the Librarian for borrowing the necessary material. Because inter-library loan agreements are not popular, the material is usually borrowed indirectly through a third party. The Librarian takes active part in the management of the Province's major professional library association, thereby informing professional colleagues to recommend their clientele to our Library.

suggestions

The facilit[illegible]

of needed j[illegible]

surplus jour[illegible] back numbers through exchange schemes [illegible]quisition of the world's duplicate and other medical libraries in the country. For lack of any biomedical library on the national and provincial scale, the small medical libraries are existing in isolation. A concerted effort by the governments and the 'have' countries towards the creation of national medical libraries is worth the efforts of international biomedical organizations.

It is worthwhile establishing international clearinghouses for the world's surplus library material in biomedical sciences, so that the individual national clearinghouses can automatically draw on the international clearinghouses. Many

medical libraries without adequate holdings would welcome the surplus library material and make real use of it. Libraries which are switching to microfilming their back issues might send these issues to such a clearinghouse. This would also include surplus books.

As a footnote, it has been observed that many medical libraries in the country even have to forego their participation in the existing exchange scheme of the WHO Library because of a condition to refund the postage in foreign currency to the donating libraries of the world. This condition is very difficult to maintain due to restrictions on the use of foreign currency. I suggest that special funds be set up to handle the situation.

acknowledgements

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Proceedings of SEATO Conference on Cholera, Dacca, East Pakistan, 1960. National Institutes of Health, Bethesda, Md.

the library and documentation centre, school of public health and institute of public health research, teheran, iran

A. Sinai

The importance of a good library in the life of a medical research institution was understood from the beginning by the directors of the Institute of Public Health Research and the School of Public Health. To carry on the training and research programmes of the institute they realized the need for a rich collection of books and periodicals, abstracting journals and bibliographies, and also duplicating and photocopying equipment. These are important research tools and are used a great deal by scientists and research workers. Rich collections of material could not be useful if the services of professionally qualified librarians were not available. Professional medical librarians are needed to work closely with specialists in making the information contained in books, periodicals, and pamphlets easily available to them. Modern library goals could not be fulfilled if the collection was not properly catalogued and arranged, if enough bibliographies, abstracting and indexing journals were not available, and the idea of active dissemination of information was not predominant.

From the Library's beginning, strong emphasis was put on services and, within the possibilities of the Institute, a good budget was allocated to the Library. However, professional librarians were not available in the country, so it was decided that potential librarians, those who could understand service ideas and active dissemination of information, should be hired, and then facilities provided in which they could be trained.

history

The Library of the School of Public Health and Institute of Public Health Research had its origins in the small departmental collection of the Chair of Parasitology, Faculty of Medicine, University of Teheran. The Institute of Malariology was established in 1953 according to a contract between the Ministry of Health and the University of Teheran and was financially sponsored by the Organization for Public Health Co-operation (U.S. Point Four). Many older periodical volumes were donated by the Organization for Public Health Co-operation. Later, the Iranian Plan Organization agreed to finance the Institute. In 1957 the Institute of Parasitology was established and the two Institutes were combined to form the Institute of Parasitology and Malariology.

The Library grew up with the Institute. It served not only the Institute staff, but also many outside scientists. In 1963 a documentation centre was formed to improve services for less easily available information. With the expansion of its field of activity, in 1965 the parent organization became the Institute of Public Health Research. In 1966 the School of Public Health was established and the Library was given the charge to serve both as a university library and a medical research library.

staff, budget, and quarters

The present staff consists of seven people. The head librarian is professionally qualified and chartered. The deputy librarian has a Master's degree in social science, has attended the American University in Beirut and WHO courses on medical librarianship, and has had training in two outstanding British medical libraries. Two other staff members have had librarianship courses in Iran. There are plans for further staff education, including sending the deputy librarian to a U.K. library school in the next two years.

The Library is fortunate to benefit from a Plan Organization book fund sufficient to cover all its material needs. This fund for the latest fiscal year was 1,500,000 rials (U.S. $20,000) which was spent on periodical subscriptions (70%) and book purchases (30%). Few Iranian libraries have materials budgets so large.

The Library is located on the first floor of the School's building, at the northeast corner of the University campus. It consists of one reading room and one work room. The shortage of space, felt in the entire School, is acutely felt in the Library, and is a handicap in expanding services and collections. The design of a new School building on a new site has been approved, and it is hoped that construction will be completed in four years. The Library will benefit from spacious quarters there.

collection

The present collection consists of 6,800 books and 303 periodical subscriptions. There is a plan for obtaining back periodical volumes. Forty-one titles have been completed and many others are nearly complete. Among the completed sets are the *Current List of Medical Literature*, many sections of *Excerpta Medica*, *WHO Bulletin*, *American Journal of Tropical Medicine and Hygiene*, *Journal of Protozoology*, and *JAMA*, only a few older volumes of which are missing. The completion of many periodical sets was due to the Library's membership in the WHO and Library Association (U.K.) Medical Section exchange programmes and in the U.S. Book Exchange, Inc. The Library receives reports and pamphlets from various research institutions and has a regular exchange programme with many of them.

Originally, the Library used a home-made classification based on the Barnard scheme. According to a general trend in the University's libraries, it was decided that the Library should be rearranged according to the LC scheme. Reclassification started in January 1968, and it is hoped that the entire Library can be reclassified in two years. Although LC is not ideal for our Library's needs, it will provide the possibility of using a centralized cataloguing system and participating in the University of Teheran Library system union list.

services

The Library offers *circulation* services 12 hours per day, excluding holidays; besides, special arrangement has been made for the faculty and staff to use the Library at any time. Reading room facilities are available to anyone, but books can be charged

out only to staff and students; the staff members of other medical institutions can borrow books with special permission from the dean.

Besides providing answers to ordinary reference questions, the Library prepares *bibliographies* according to specific requests from patrons on their subject of interest. This service is especially useful for graduates and for medical students preparing theses.

To help those patrons who do not live in Teheran or cannot visit the Library for long periods of time, and also to provide materials which the Library lacks, a *photocopy service* has been established On specific request, photocopies are prepared, free of charge, from periodical papers. Arrangements have been made with three other local medical libraries so that photocopies can be made from their periodical holdings, also. In 1967, photocopies from 139 periodical articles in 631 pages were made available to research workers. In order to provide materials unavailable in Iran, the Library uses the photocopy service of the Science Museum, London, and of the NLL. Through the courtesy of CENTO, this service is provided free of charge. In 1967, photocopies from 26 periodical articles in 207 pages were made available to research workers.

Translation service is provided from English, French, and Russian. Since most patrons read either English or French, the majority of requests are for translations of Russian periodicals received by the Library. Requests for translations from English come second, and from French, third. Although the Library receives cover-to-cover translations of a few important Russian periodicals, requests for translations from Russian are received in great numbers.

The Library publishes a *monthly bulletin* which lists all accessions and reviews a few important books in each issue A *printed catalogue* has been published in a new edition each year. The 'Library News' and catalogue are widely circulated among Iranian libraries and medical research workers and are used as book selection tools in a few medical libraries.

VI

pictorial exhibitions in medical libraries

E. Gaskell

I think it true to say that most rare book librarians look upon the preparation of book exhibitions as a necessary and rewarding activity; necessary because it informs them where the strengths and weaknesses of their collections lie, rewarding as all acts of creation must be rewarding. On the other hand, if these same librarians were asked to justify the time and effort they devote to exhibitions on the basis of the total volume of interest these arouse amongst readers, then I should expect to hear some equivocal replies. It might be possible, I suppose, by using a system of questionnaires, to chart the reactions of our visitors to particular exhibitions, but to succeed in this we should have to be equipped with the necessary skills in how to interpret answers not always honestly given to precisely formulated questions. Whilst as librarians we well know that most of our readers are not bibliophiles and could be quite soon reconciled to living with microfilms as substitutes for books. To me at any rate, it does seem that if we are to continue exhibiting our treasures we must do so largely as an act of faith.

I say all this, by way of introduction, to make my position clear on the subject of book exhibitions; but having said this I wish to turn my attention to something which, though closely allied, does not normally constitute part of a librarian's duties. This is the preparation of pictorial exhibitions, of the kind the Wellcome Library has been mounting for the past six or seven years as a means of supplementing its displays of books. These exhibits, mounted on panels of softboard, are photographs copied from illustrations in the Library's books and manuscripts, and occasionally also from other forms of art such as paintings and sculpture. They are intended as a means of presenting medical history visually through an emphasis on the graphic content of books rather than, as is more usual, the textual. We think that it is possible to do this without debasing the subject, always a danger when one's public is diffuse and variously educated, if one chooses the illustrative material wisely and describes it soberly.

Most visitors to the Wellcome Library are of serious and sober intent, and come to be informed rather than entertained. They consist of various categories, of which the most important are the researchers. The latter's needs are simple and well defined, *i.e.*, a good supply of books and bibliographic assistance when asked for. These people, of course, know their business and usually regard exhibitions as a pleasant bonus. But there is also the much larger number of visitors, comprised of students in many disciplines, often at the postgraduate level, for whom medical history is a virtually unexplored field. To these can be added the doctor and the medical student interested in an amateur sort of way in their chosen specialty, the journalist, the television producer, the sixth former at school, the teacher, the educated adult. All of these categories visit the Wellcome Library at one time or another; all are liable to have their imagination quickened and their interest aroused by exhibitions of pictorial material.

Our measure of success cannot, of course, be exactly or even approximately

determined. We do know, however, that teachers show great interest in the exhibitions; that parties of students circulate around them notebook in hand jotting down the information which accompanies each exhibit; that three postgraduate medical centres display them after they have run their course in the Library; that medical congresses place them in their foyers and sometimes commission new ones; and that a recent one was included in the arts festival of a northern town.

The bounds of medical history are wide; correspondingly so is the range of subjects within it which lend themselves to exhibition by way of illustrations. There is a wealth of variety of woodcuts, engravings, and lithographs in old and not so old medical books, not all of them 'scientific' in the modern acceptation of the term. These the Wellcome Library utilizes, avoiding over-specialization and abstruse terminology, in such a way that they can be understood by the educated layman.

The exhibitions we have so far mounted have thus been on fairly general topics, such as education, hospitals, and pharmacy, but on more specialized ones too, such as balneology, physical medicine, paediatrics, psychiatry, and cardiology. Three of these were particularly interesting when we came to relate them to general social and intellectual history, as we had to do if we were to make them meaningful to the educated public described above.

To take psychiatry first, it is a comparatively young specialty, designated by a term coined in the 19th century, yet evolved out of the cumulative knowledge gained by man from his acquaintance with mental disorder as a permanent problem in society. No one with a knowledge of medical history needs reminding of this basic fact, but it is necessary to emphasize it here in the context of this paper's theme. For psychiatry, as we know it, has many antecedents about which the educated layman is often better informed than about psychiatry itself. By bringing these antecedents into the story, we stand a good chance of capturing his interest. There is the fascination of witchcraft (Trevor-Roper, 1967), for instance, with all its many implications for the history of religion in the 16th and 17th centuries; there is the phenomenon of crowd mania; there is the world of 18th century politics when the destinies of England and America were swayed by an apparently unstable monarch suffering in reality from hereditary disease (McAlpine and Hunter, 1968); there is the clash of enlightened opinion with entrenched reactionary, sometimes inhuman, views on how society ought to be regulated for its own good; there are the innumerable connections between mental disease and the worlds of art, literature, and music (Hunter and McAlpine, 1957; Schneck, 1966; Eldridge, 1966). Of illustrations with which to depict the whole graphic story there is no lack, for one can turn to woodcuts, engravings, paintings, and sculptures reaching right back into the early Middle Ages and even beyond. In this way, psychiatry, as we know it today, can be put into its true historical perspective, as the creation of a society which has largely lost faith in the power of the supernatural to control or subdue signs of mental disorder.

The history of paediatrics is another excellent topic for visual [illegible] we have a specialty which grew to maturity during the 19th century; [illegible] involved in fundamental social issues, this time the rise and fall of [illegible] changing attitudes of society to children. Schools and colleges [illegible] in their courses on modern history, and teachers generally [illegible]

of the role played by such outstanding figures as Chadwick and Shaftesbury. But how many teachers are informed about the trends in child mortality, or the date when children's hospitals became an accepted fact, or the fluctuation in morbidity from the various children's diseases? And how many know of the wise advice on child-care already available to the literate person in Renaissance times, advice which had been copied from the Arabs, the Greeks, and the Romans? The paediatrics exhibition mounted in the Wellcome Library dealt with the aspects described above and with others, such as child labour and domestic life. Pictorially speaking, the main problem it posed was one of selection. The wide interest it excited offered reward enough to all who were involved in its preparation.

My third example is cardiology. Now this may seem unpromising intellectual fare for public consumption, for cardiology is, of course, a subject which is scientifically based to a very marked degree, and to that extent largely incomprehensible to most laymen. But when one digs beneath the surface, looking for relationships which are not wholly medical, one is soon led into areas of thought where medicine as we understand it plays little part. This has the added advantage of enabling us to choose from a wider variety of illustrations than one would normally expect to see in an exhibition on modern cardiology. In all exhibitions, I submit, one has to recognize the limits of one's material, as well as the capacity of one's visitors for understanding and enjoying it. This being so, it seems as reasonable to illustrate the varying beliefs of civilization and ages other than our own on the functions of the heart as to concentrate on the development of cardiology over the last 300 years. Illustrations abound (*Das Herz*, 1967), and naturally so, as this is a subject which brings us into anthropology, religion, symbolism, and art. I shall mention only the ancient Egyptian *Book of the Dead* (Budge, 1899), in which the heart is ceremonially weighed before the entry of the deceased into the netherworld; the vivid and excruciating scenes of Aztec sacrifices (Nuttall, 1913), in which the heart is held up to the Sun God; mediaeval anatomical illustrations; the 17th century books of emblems contemporaneous with Harvey (Haeften, 1629) where the heart figures surprisingly often; and the diagrams drawn by medical historians in which different concepts of blood circulation are made clear (Keele, 1965). Quite obviously, it would be wrong to stress the symbolic aspect (U.S. NLM, 1966; Schadewaldt, 1962) to the detriment of the purely medical, but it is possible to strike a balance if one sets one's sights on showing the interdependence, at all times in human history, of medical ideas and the successive states of society in which these ideas originated.

I hope, by now, that I have left no doubt about the tremendous resources represented by this combination of medical and paramedical iconography. The Wellcome Institute can afford to indulge in this rather luxurious interpretation of medical history simply because it has at its disposal a very large number of illustrated reference and source books in the field of religion, art, literature, and topography, in addition to which there is a large quantity of photographic negatives accumulated over several decades.

Preparing an exhibition of this kind can have certain consequences for the staff of a library. In the first place, one's sensitivity to illustrated as against textual material becomes heightened. By this I mean that one examines illustrations more closely,

both during the time when an exhibition is in gestation and for long afterwards. One may notice a significant detail, in a Hogarth print (Coley, 1967; Grange, 1963) or in an Old Master, which can be enlarged and then placed in its appropriate setting within an exhibition. Or it may be that an illustration assumes new significance in the light of the exhibition theme with which one has necessarily become preoccupied. The work entailed in all this can have an enduring value for a library, if, when an exhibition is finally taken down piece by piece and stored away or perhaps sent for display elsewhere, an album of snapshot-size prints is retained as a permanent reference tool. Further illustrations, discovered by chance or serendipity, can be added to it as and when they turn up, which can then be used by lecturers in the form of slides.

Now you might well say, how can a smaller, more orthodox medical library than the Wellcome exploit its much less rich, far more specialized collection of illustrated books? Obviously, the average small library can hope to do very little in this way, if it is forced to discard material as soon as it becomes obsolete. But there *are* libraries which, though committed to discard in general terms, retain old material within special areas: more often, I suspect, out of a reverence for the printed word than from a just appreciation of the value of illustrations.

When we consider the large number of medical libraries with substantial collections of old books and journals, we can visualize how great the total resources of the world must be in the matter of illustrations. How many of these libraries index them as the New York Academy of Medicine has been doing for years past? It would be useful to know. There is obviously room, too, for collaboration between medical librarians and curators of rare books where a medical library forms part of a much larger complex, as, for instance, in a university library. Out of such collaboration could well stem exhibitions on medical topics based on the full range of a university library's collections. And perhaps one can hope that when a library indexes (Schadewaldt *et al.*, 1967) the illustrations in its collections, these records will be made available to any other library expressing interest in them.

Recent and continuing extensions to the Wellcome Institute's Museum have now changed the Library's role *vis-à-vis* exhibitions. So far as pictorial exhibits are concerned, these are now held in the Museum and are a collaborative enterprise of library and museum staffs. It goes without saying that they gain immensely from being integrated with three dimensional objects.

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list of abbreviations

AAAS	American Association for the Advancement of Science
AHA	American Hospital Association
AHIL	Association of Hospital and Institution Libraries (U.S.A.)
AID	Agency for International Development (U.S.A.)
AIP	American Institute of Physics
ASLIB	Association of Special Libraries and Information Bureaux (U.K.)
A.U.B.	American University of Beirut
BA	*Biological Abstracts*
BIOSIS	BioSciences Information Service of Biological Abstracts
BIREME	Biblioteca Regional de Medicina (Brazil)
BNB	British National Bibliography
BOA	*Bibliography of Agriculture*
BSI	British Standards Institution
BT	broader term
BUCOP	*British Union-Catalogue of Periodicals*
CA	*Chemical Abstracts*
C.A.N.DO	Classification Alpha-Numérique de la Documentation médicale
CAS	Chemical Abstracts Service
CASTASIA	Conference on the Application of Science and Technology to the Development of Asia
CBAC	Chemical Biological Activities (CAS)
CCC	Central Classification Committee (FID)
CENTO	Central Treaty Organization
CHA	Catholic Hospital Association (U.S.A.)
CIS	Centre International d'Information de Securité et d'Hygiène du Travail
CLA	Catholic Library Association (U.S.A.)
CODATA	Committee on Data for Science and Technology
COSATI	Committee on Scientific and Technical Information (U.S.A.)
CRS	Chinese Restaurant Syndrome
CT	*Chemical Titles*
DC	Dewey Decimal Classification
DIN	Deutsche Industrie Normen
DNB	*Dictionary of National Biography*
DRTC	Documentation Research and Training Centre (Bangalore)
EDUCON	Inter-University Communications Council (U.S.A.)
EJC	Engineers Joint Council
EM	*Excerpta Medica*
EMCLASS	Excerpta Medica Classification System
EMRO	Eastern Mediterranean Regional Office (WHO)
ESRO	European Space Research Organization
ETC	European Translation Centre (Delft)
FASEB	Federation of American Societies for Experimental Biology
FDA	Food and Drug Administration (U.S.A.)
FID	Fédération International de Doc
FID	Fédération International de Documentation
GRACE	Graphic Arts Composing Equipment
HEW	U.S. Department of Health, Education and Welfare
H.R.	House of Representatives (U S.A)
IABS	*International Abstracts of the Biological Sciences*
IBBD	Instituto Brasileiro de Bibliografia e Documentacão
ICSU	International Council of Scientific Unions
IDC	Internationale Dokumentationsgesellschaft für Chemie
IFAC	Institut des Fruits et Agrumes Coloniaux (France)
IFIP	International Federation for Information Processing
IFLA	International Federation of Library Associations
INI	*International Nursing Index*
INSDOC	Indian National Scientific Documentation Centre
ISA	*Indian Science Abstracts*
ISI	Institute for Scientific Information
ISO	International Organization for Standardization
IUBEN	International Union of Biochemistry: Enzymes
KWIC	Keyword in Context
KWOC	Keyword out of Context

LC	Library of Congress Classification
MALIMET	Master List of Medical Indexing Terms (Excerpta Medica)
MARC, MARC II	Machine Readable Cataloging (Library of Congress)
MCAT	Medical College Admissions Test
MEDICO	A Service of Care (Cooperation for American Remittances for Everywhere)
MEDLARS	Medical Literature Analysis and Retrieval System (NLM)
MeSH	Medical Subject Headings (NLM)
MIP	Missouri Institute of Psychiatry
MLA	Medical Library Association (U.S.A.)
M.Lib.Sc.	Master of Library Science
NAL	National Agricultural Library (U.S.A.)
NAR	*Nutrition Abstracts and Reviews*
NASA	National Aeronautics and Space Administration (U.S.A.)
NCMHI	National Clearinghouse for Mental Health Information (U.S.A.)
NCR	National Cash Register Company
NELINET	New England Library Network
NIAMB	National Institute of Arthritis and Metabolic Diseases (NIH)
NIH	National Institutes of Health (U.S.A.)
NLL	National Lending Library for Science and Technology (U.K.)
NLM	National Library of Medicine (U.S.A.)
NML	National Medical Library (India)
NRCC	National Research Council of Canada
NSF	National Science Foundation (U.S.A.)
NSL	National Science Library (Canada)
NT	narrower term
NUC	National Union Catalog (U.S.A.)
OECD	Organization for Economic Cooperation and Development
OSTI	Office for Scientific and Technical Information (U.K.)
PA	*Psychological Abstracts*
PAHO	Pan American Health Organization
PANSDOC	Pakistan National Scientific and Technical Documentation Centre
PAS	para-aminosalicylic acid
PHS	Public Health Service (U.S.A.)
PL	Programming Language
P.L.	Public Law (U.S.A.)
PPM	Papers Presented at Meetings
P-SCRL	Pakistan-SEATO Cholera Research Laboratory
PSI	*Permuterm Subject Index (SCI)*
RINGDOC	Derwent Chemical and Pharmaceutical Information Service
RIOS	Reprodukčni Informační Obsahová Sluzba (Czechslovakia)
RMP	Regional Medical Program for Heart Disease, Cancer, and Stroke (U.S.A.)
RT	related term
SABIR, SABIR-C	Système Automatique de Bibliographie, d'Information et de Recherche en Carcinologie
SCI	*Science Citation Index*
SCSML	State Central Scientific Medical Library (U.S.S.R.)
SDI	Selective Dissemination of Information
SLA	Special Libraries Association (U.S.A.)
SPS	Symbolic Programming System
SRCC	Serial Record Control System on Computer (Japan)
SSS	Symbolic Shorthand System
TWX	Teletypewriter Exchange
UCLA	University of California at Los Angeles
UDC	Universal Decimal Classification
UNISIST	World Science Information System (ICSU/UNESCO)
UNRRA	United Nations Relief and Rehabilitation Administration
USASI	United States of America Standards Institute
VA	Veterans Administration (U.S.A.)
VNIIMI	All-Union Scientific Research Institute of Medical and Medico-Technical Information (U.S.S.R.)
WATS	Wide Area Telephone Service
WLSP	*World List of Scientific Periodicals Published in the Years 1900-1960*

index of contributors

subject index

Subject Index prepared by W.D. Sweeney, M.A., Dip. Lib.